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COLUMBIA RIVER BASIN BELOW YAKIMA
RIVER

Public Health Service
Portland, Oregon

1953

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REPORT ON WATER POLLUTION CONTROL

COLUMBIA RIVER BASIN BELOW YAKIMA RIVER

1953

A COOPERATIVE STATE-FEDERAL REPORT

Prepared by:
Pacific Northwest Drainage Basins Office
Division of Water Pollution Control
Public Health Service - Federal Security Agency

In Cooperation With
Oregon State Sanitary Authority
Washington Pollution Control Commission

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INTRODUCTION

The Federal Water Pollution Control Act, Public Law 845, passed by the 80th Congress in June 1948, requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies and with municipalities and industries in the preparation or adoption of comprehensive programs for elimination or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary condition of surface and underground waters. The Act states that "...in the development of such comprehensive programs due regard shall be given to the improvements which are necessary to conserve such waters for public water supplies, propagation of fish and aquatic life, recreational purposes, and agricultural, industrial, and other legitimate uses."

This report, based on data available as of June 30, 1953, has been prepared in cooperation with the Oregon State Sanitary Authority and the Washington State Pollution Control Commission. The report presents information on sources of pollution, amounts of pollution entering water resources and resulting damages, treatment facilities or other control measures presently employed, and requirements for pollution prevention and abatement. Also discussed in detail are the present and future uses of the basin's water resources.

Data and knowledge now available are sufficient to permit the immediate solution of most of the pollution problems within the basin of the Columbia River below the Yakima River without awaiting the results of additional surveys and studies.

A sincere effort has been made to present a fair picture of the water pollution problems in the Columbia River Basin below the Yakima River, and this report is offered as a basis for a comprehensive program for water pollution control and abatement for this basin.

ACKNOWLEDGEMENTS

The Public Health Service wishes to acknowledge the cooperation of those agencies and individuals who have contributed to the preparation of this report.

The Oregon State Sanitary Authority and the Washington State Pollution Control Commission furnished the basic information and actively cooperated in the preparation of this report. Valuable data and assistance were also furnished by other State agencies, including the Oregon State Board of Health and the Washington State Department of Health.

Federal agencies from whom assistance was obtained include: the Corps of Engineers, Department of the Army; the Bureau of Reclamation, the Fish and Wildlife Service, and Bonneville Power Administration, Department of the Interior; and the Forest Service and Soil Conservation Service, Department of Agriculture.

SUMMARY

The term basin as used herein includes all of the area drained by the Columbia River below the mouth of the Yakima River, except those areas drained by the Snake and Willamette Rivers. It includes an area of 35,000 square miles, 73 percent of which is in Oregon and 27 percent in Washington.

The Columbia River enters the basin from the north at mile 335. Near the Oregon-Washington boundary, about 25 miles downstream it turns abruptly and flows in a westerly direction to the Pacific Ocean. In this lower stretch the river flows through the Cascade and Coast Mountain ranges.

Industrial expansion in shipbuilding and aluminum production during World War II caused a large influx of population. In 1950 about 528,300 people were living within the basin, 33 percent more than were living there in 1940.

The Columbia River, with its present and potential waterborne commerce, power production, extensive fishery, and recreational attractions is the basin's greatest natural resource. Industries which process agricultural and forest products from surrounding areas, and raw and partially processed commodities from other regions, are located adjacent to Columbia River where water supplies, hydroelectric power and transportation are ample.

Although waters of the Columbia River are adequate for present and foreseeable future needs, most of the tributaries entering the main river in this basin have an inadequate supply during summer months. In the semi-arid areas east of the Cascades, it is difficult to obtain adequate water supplies for municipal, industrial, and agricultural uses. West of the Cascades major water requirements are confined to localities adjacent to Columbia River, where both surface and ground waters are plentiful. Water resources of the basin, in addition to being used extensively for fish and wildlife propagation, recreation, navigation, and power production, are presently used for irrigating about 285,000 acres of land, supplying the domestic and industrial needs of 128 municipalities and furnishing the industrial needs of more than 109 plants which have their own supplies.

Further development of the basin's water resources is urgently needed. Construction now underway and planned, including the Lower Columbia River Fishery Development Program, will increase the hydroelectric power production capacity by about 3,500,000 kilowatts, provide storage and other facilities to irrigate an additional 778,000 acres of new land and supplemental water for about 150,000 acres, provide for increased navigational use of the main river, and will conserve to the greatest possible extent the valuable fishery resources. In addition, these new developments will provide additional sources of municipal, industrial, and livestock water supply; increase recreational opportunities; add to the extensive tourist trade; and provide regulated flows which may benefit water pollution control.

The Willamette River Basin, in Oregon, is in reality a part of the Lower Columbia River Basin. It contributes to the pollution of Columbia River in a similar manner as do the other tributaries included in this basin. For purposes of convenience in developing and carrying to completion a comprehensive pollution abatement program, the Willamette Basin has been considered in a separate report. Its relationship to the Lower Columbia River Basin, however, cannot be entirely omitted from a discussion of the pollution problems in this basin. Within the next few years all of the wastes from Portland will be taken from the Willamette River, treated and discharged to the Columbia. The principal cause of serious pollution in Multnomah Channel is from wastes presently discharged into Willamette River.

For the above reasons, data on sources of pollution are for all wastes discharged to the Columbia River and its tributaries (including Willamette River) below the mouth of the Yakima and Snake Rivers. In this area, there are 129 sources of municipal and 180 sources of industrial pollution which contribute wastes with a population equivalent of nearly 6,900,000.

Municipal pollution which includes the wastes from cities, towns, institutions, sanitary districts, military establishments, and other population centers, is contributed to the basin's watercourses from 95 sources in Oregon and 34 sources in Washington. These municipal wastes consist of the domestic sewage from 671,720 people in Oregon, 118,730 people in Washington, and the industrial wastes from plants connected to municipal sewers.

Because of the industrial establishments connected to city sewerage systems, the population equivalent of the mixed wastes from all municipalities in the basin, in spite of the treatment given, is greater than the sewered population of 790,450, or about 1,054,660. Of this total nearly 67 percent is discharged to watercourses in the Willamette River Basin.

Industrial pollution, which includes the wastes from industries having separate outlets to the watercourses, is contributed from 118 sources in Oregon and 62 sources in Washington. The organic wastes discharged to watercourses from Oregon industries have a population equivalent of more than 3,290,000 and from Washington industries about 2,516,000. Nine industries in Oregon and eight in Washington discharge inorganic wastes. Of the total waste about 48 percent is contributed by Willamette River Basin industries.

Pollutional damages occur principally during the late summer and early fall periods when stream flows are at a minimum. During the remainder of the year dilution by large quantities of water rushing down from the mountains reduces the damaging effects of pollution. Wastes discharged during low flow periods in the Walla Walla, Umatilla, and Cowlitz River basins, and into Multnomah Channel and Columbia Slough, cause the most serious damages. However, in other tributaries

and the main stem of the Columbia River the raw sewage component of wastes discharged into these waters causes excessive bacterial contamination. Also the disposal of domestic wastes in a number of unsewered communities through individual septic tanks or directly into streams and lava sinkholes is causing pollution in small watercourses and public water supply aquifers. These unsewered communities must install sewers and construct treatment plants in order to correct these unsatisfactory conditions.

A vigorously prosecuted pollution control program in this basin will restore waters now damaged by pollution to a quality satisfactory for all present uses, and preserve the excellent quality of the basin's unpolluted waters. In addition, water pollution control will assure an adequate quality of water for future developments within the basin.

Excluding the Willamette River Basin, municipal sewage treatment works now serve nearly 75 percent of the total sewered population of 292,630. Forty-five of the 81 cities, institutions, military establishments, and other sewered areas have sewage treatment facilities ranging from modern secondary treatment plants to small septic tanks.

Eighty of the 132 industrial establishments with separate outlets have installed waste treatment, recovery, or other facilities which reduce or prevent pollution.

Of the 45 existing municipal treatment plants, 27 are of adequate capacity and 36 are operated satisfactorily. Only 34 of these facilities are entirely satisfactory. Of the 85 existing industrial treatment facilities, 71 provide adequate treatment or other satisfactory disposal of wastes.

Twenty-one of the municipal and 29 of the industrial facilities have been installed since 1945. The municipal plants were designed to serve a population of 216,600. The industrial facilities provide treatment or better methods of disposal for wastes having a population equivalent of 3,708,100.

Specific needs in the pollution control program of the basin are adequate sewage treatment facilities for all municipalities and other sewered areas, sewers and treatment plants for a number of the presently unsewered communities, treatment or other satisfactory disposal of industrial wastes, and protection of watershed areas from activities that destroy or damage the water resources.

The municipal waste treatment needs include 44 projects to serve an estimated population of 210,690. Nineteen municipalities require new treatment plants, four enlargements or additions to existing plants, three replacements and three require connections to other municipal sewerage systems. Twelve communities require both sewerage systems and treatment plants. The treatment plants of three communities require improved operations and maintenance. Seventeen of these projects are for municipalities in Oregon and 27 for Washington municipalities.

The program for the abatement of industrial waste pollution includes 75 projects. Thirty-six of these needs are for new waste treatment plants or other pollution control measures, 17 are for enlargement, expansion or improved operation of existing facilities, and 21 are for connection to municipal sewerage systems. One industrial waste treatment facility requires replacement. Thirty-two of these projects are for Oregon industries and 43 for industries in Washington.

Five municipal projects are under construction including Athena and Heppner which are practically complete at the present time, and 11 municipal and 10 industrial facilities are being planned. Twenty-nine municipal projects and 65 industrial projects are inactive.

Of the 44 requirements for abatement of municipal pollution, three will be met by the end of 1953 when the treatment facilities in the State of Washington now under construction will be in operation.

The 119 municipal and industrial pollution abatement projects are estimated to cost approximately \$11,000,000. A breakdown of these estimates showing municipal and industrial projects separately by States are as follows:

<u>State and Type of Projects</u>	<u>No. of Projects</u>	<u>Estimated Construction Cost</u>
Oregon		
Municipal	17	\$ 2,500,000
Industrial	32	650,000
Subtotal	49	\$ 3,150,000
Washington		
Municipal	27	\$ 3,400,000
Industrial	43	4,700,000
Subtotal	70	\$ 8,100,000
TOTAL FOR BASIN	119	\$11,250,000

The above estimates are exclusive of those for the Willamette River Basin. The estimated cost of completing the Willamette River Basin Program is about \$8,000,000.

Logging, road construction, and farming often create conditions which lead to pollution caused by erosion in the watershed areas. The silt, logs, slashings, and other debris carried into the watercourses during periods of heavy run-off and floods deteriorate the quality of the water and block off or otherwise destroy fish-spawning gravels.

CONCLUSIONS

1. The Columbia River is a great natural resource not only to this basin, but to the entire Pacific Northwest and the Nation. During and since World War II there has been a rapid industrial development along the lower Columbia River and a further expanded economy, principally in manufacturing and processing, may be expected as a result of the water resources development program now under way for the river.
2. An increase in both domestic and industrial waste will accompany the expansion in manufacturing and processing industries.
3. The Columbia River, its clear tributary streams, the large multiple purpose dams, and the forests and mountains, will attract an increasing number of tourists and sportsmen to the basin. In order to fully protect the value of these resources, pollution of the waterways must be properly controlled.
4. Surface waters, which must supply the needs of municipalities and industries, and irrigate rapidly increasing land areas, must be protected from bacterial and chemical contamination by adequate pollution control measures.
5. Foreseeable future water uses, water quality objectives, and the degree of waste treatment necessary to properly control water pollution have been determined by the States of Oregon and Washington.
6. Rapid progress is being made in the construction of pollution abatement projects in this basin as indicated by the 34 municipal and industrial facilities constructed since 1945, and the seven municipal and two industrial treatment facilities presently under construction.
7. The Columbia River below the Yakima, being the boundary between two states, presents an interstate water pollution problem.

RECOMMENDATIONS

It is recommended that:

1. All industries provide the necessary facilities to comply with the minimum requirements for industrial waste prevention, treatment, and disposal in accordance with the regulations adopted by the respective State pollution control agencies.
2. All saw mills in the basin provide facilities to prevent sawdust, bark, and other debris from entering watercourses as required by State laws and regulations.
3. The municipalities and industries included in the Project List, Table J, page 26, provide adequate facilities for the collection and treatment or other satisfactory disposal of their wastes.
4. The States provide adequate funds to their respective pollution control agencies for the development and execution of comprehensive programs of pollution abatement.
5. Programs be developed for improving the operation of waste treatment plants and current training activities for plant operators be expanded.
6. Agricultural, forestry, and mining agencies, which have developed programs and specifications for soil and moisture conservation on agricultural lands, logging and road construction on forestry lands, and mining and dredging operations be encouraged to vigorously prosecute their programs on public lands under their jurisdiction. At the same time they can also be helpful in reducing pollution from similar operations on privately-owned lands by publicizing and encouraging proper land, forest, and mineral resource conservation practices.

PHYSICAL DESCRIPTION

Geography

This basin includes all of the area drained by the Columbia River between the mouth of the Yakima River and the Pacific Ocean, except those areas drained by the Snake and Willamette Rivers. The area included, totals 35,800 square miles. Of this total, 26,120 square miles are in Oregon and 9,680 square miles are in Washington. Data on drainage areas of the Columbia River are included in Table 1 of the Appendix.

Topography

Elevations in this basin range from sea level to 14,408 feet above mean sea level at the summit of Mount Rainier. In addition to Mount Rainier, which is located on the basin divide to the north, two snow-capped peaks, Mount Adams and Mount St. Helens, are entirely within the basin. These two peaks rise to elevations of 12,307 feet and 9,671 feet, respectively. Mount Hood, the highest point on the Oregon side to the south has an elevation of 11,245 feet above mean sea level. Generally, the terrain on either side of the Columbia rises to high elevations in a series of nearly vertical cliffs and more or less wide benches. The Blue, Cascade, and Coast mountain ranges rise steeply above these benches. The Columbia River cuts the latter two ranges in its westerly course to the Pacific Ocean.

The principal tributaries of the Columbia River included in this basin are the Walla Walla River in Oregon and Washington; the Umatilla, John Day, Deschutes, Hood and Sandy rivers, and Willow Creek, in Oregon; and the Klickitat, White Salmon, Lewis and Cowlitz Rivers and Salmon Creek in Washington. Data on characteristics of the Columbia River and its principal tributaries in this basin are included in Tables 2 and 3 of the Appendix.

Climate

The climate of the basin is widely diversified. The Cascade Mountain Range serves as a barrier to the prevailing westerly winds from the Pacific Ocean. East of that divide the climate is subject to continental influences and is quite varied and semi-arid. West of the Cascades the climate is generally mild and moist.

Extremes in temperature occur quite frequently in areas east of the Cascades. They range from a minimum of -33 degrees F. to a maximum of 119 degrees F. The mean annual temperature east of the Cascades varies from 46.7 degrees F. to 54.1 degrees F. West of the Cascades the mean annual temperature in lower elevations varies from 51.2 degrees F. to 53.1 degrees F.

West of the Cascades, precipitation varies from a low of about 40 inches to an estimated 150 inches or more in some higher elevations. Precipitation decreases rapidly east of the Cascades to a minimum of about 7 inches at Kennewick, Washington. Over the higher mountains of the eastern portion, the normal amount is about 50 inches.

A major portion of the precipitation in the higher mountains consists of snowfall which in some localities amounts to more than 300 inches during an average year. This snowfall is very important in connection with the stream flows of many of the tributary streams.

The growing season varies from 91 days at Bend, Oregon, to 273 days at Astoria, Oregon. Freezing occurs in the higher mountain ranges throughout the year.

Climatological data are included in Table 4 of the Appendix.

Hydrology

Because of the lack of storage facilities, the water resources of this basin during the late summer months are largely dependent upon melting snow from higher mountain areas. Precipitation, which occurs during the winter and spring months as rainfall, causes high flows in the tributaries sometimes resulting in damaging floods. Although natural sub-surface storage regulates the flow of some streams during the summer and early fall months, in most parts of the basin inadequate flows occur in tributary streams during this period. Many of the smaller streams are dry during summer months. Large diversions for irrigation, also, cause some of the larger tributaries to become dry. However, the flow of the Columbia River main stem, drawing upon its vast drainage area, is more than adequate in all seasons. In fact, the resources of the main stem far exceed those of any other stream in the Pacific Northwest.

About 180,000,000 acre feet of water are discharged to the Pacific Ocean by the Columbia River during a year of average flow. High water usually occurs in the main stem during the months of May, June and July. Lowest flows usually occur from October through February. Flood damage occurs along the lower Columbia River when flows exceed 600,000 cubic feet per second at The Dalles, Oregon. During three years flows of a magnitude of more than 1,000,000 cubic feet per second at The Dalles are known to have occurred. These were during the years 1876, 1894, and 1948. The 1948 flood caused damages amounting to more than 100 million dollars. The total loss of life resulting from the flood was 50 persons. Approximately 120,000 persons were evacuated from their homes.

Hydrologic data for the main stem and principal tributaries are included in the sections of this report devoted to these rivers. Flow data for particular streams are given in Table 2 of the Appendix.

ECONOMIC DEVELOPMENT

Much of the economic development of the Pacific Northwest, and particularly that of this basin, is dependent upon the Columbia River. The river's present and potential waterborne commerce, power production, and extensive fishery are the basin's most important natural resources. Land resources of the basin produce large quantities of raw materials. Mills and manufacturing plants located in the basin process these and also use raw and partially processed materials from surrounding areas and other parts of the world.

The land area of the basin, about 22½ million acres, is fairly evenly divided between forests and agricultural or range lands. About 40 percent of the land area is in public ownership, national forests accounting for about two-thirds of the public lands. Data on land distribution and ownership are shown in Tables 5 and 6 of the Appendix.

Population

The population of this basin in 1950 was 528,300. Approximately 52 percent of this population resided in Oregon and 48 percent in Washington. During the period 1940 to 1950, population increased about 33 percent. Data on population growth and distribution are shown in Table 7 of the Appendix.

The population is largely urban. In 1950, 63 percent of the people lived in incorporated or unincorporated places of over 500 population (1950 Census--Advance Reports). Employment in manufacturing accounted for 41.3 percent of the industrial workers in 1951. During that year the States reported a total of 117,615 industrial workers. This total was estimated to represent about 75 percent of the total wage earners. Not included in the total are agricultural, government, railroad, and domestic workers. Data on industrial employment are shown in Table 8 of the Appendix.

Agriculture

Although only about 9 million acres of land are presently or potentially suitable to agriculture, some 10.5 million acres are contained in the 22,000 farms located in the basin. An additional 4.4 million acres of national forest land is used for range purposes. The major portion of the agricultural lands is located east of the Cascades. Land and buildings on farms were valued at 285 million dollars in 1945. According to the 1944 census of agriculture, farms produced products with a gross value of approximately 111 million dollars during that year. Livestock and livestock products accounted for about 34 percent of the total gross value.

The importance of agriculture to the local economy varies over the basin. East of the Cascades and adjacent to Columbia River the major sources of income are wheat, other small grains, and peas. Beyond these wheat farms are vast areas of range lands where the principal source of income is from raising cattle and sheep. The Hood River Valley in Oregon and an area near Kennewick, Washington, are devoted principally to growing fruit. West of the Cascades the major agricultural pursuits are dairying, poultry raising, and fruit and vegetable growing on small farm units. Data on agricultural resources and gross farm incomes are shown in Tables 9 and 10 of the Appendix.

Excepting in the Deschutes River Basin, irrigation has been of minor importance in the overall basin economy. Lands presently irrigated from other streams normally have an inadequate supply. These landowners depend upon dry farming or livestock as their principal source of income. About 285,600 acres of land are presently irrigated. Authorized and proposed projects of the Bureau of Reclamation include developments for a supplemental supply for 148,690 acres of land and a full supply for 777,580 acres of new lands. Data on existing, authorized, and proposed irrigation projects are shown in Table 11 of the Appendix.

Forestry

A total of 11.3 million acres of land, or one-half the area of the basin, is forested. Most of these forested areas are located west of the Cascades and produce a substantial part of the raw products required by lower Columbia River mills. The forests contained about 107.5 billion board feet of unreserved saw timber as of January 1, 1945. About 62 percent of the unreserved supply is contained in national forests and other publicly-owned and managed land areas.

Log production in 1941 was about 2.3 billion board feet. From 1945 to 1948, inclusive, the average annual production was more than 1.6 billion board feet. Data on unreserved saw timber and log production are shown in Tables 12 and 13 of the Appendix.

Mining

Although minerals occur rather generally over the basin, the principal metallic mining operations are carried out in the southeastern section. Gold, silver, copper and lead, with an average annual value of \$325,000 were mined in this area during the period 1941-45. Mining operations have recently started on a large deposit of diatomaceous earth at Terrebonne, in the Deschutes River Basin.

Fishery

Some commercial fishing in the Columbia River was carried on almost from the outset of the white man's occupation of the basin near the beginning of the nineteenth century. The first fish were commercially exported in 1830. Commercial production increased very rapidly until 1883 when a peak catch of 43 million pounds was attained. In addition to the river fishery, the salmon have contributed to an ocean troll fishery extending from California to Alaska.

Since 1883 there has been a downward trend in the poundage of fish production. However, this trend has not been significant during recent years. The average annual catch during the period 1940-49 is estimated to total about 31 million pounds. This includes the commercial river and ocean troll catch, Indian subsistence catch, and sports catch, and is valued at \$18,605,000 on the basis of the first wholesale level for the canned product. Data on the annual production and value of Columbia river salmon is shown in Table 14 of the Appendix.

Various reasons have been given for the decline in Columbia River salmon runs. Those relating to a more intensive fishery; the reduction of spawning grounds by logging, mining, irrigation, power, navigation and flood control developments; and water pollution appear to have been most damaging.

Manufacturing

In 1947 there were 41,500 people working in 866 manufacturing industries. These workers' wages amounted to \$123,000,000. The value added to products by manufacturers was reported by the Census Bureau to be \$285,415,000. The Employment Services of Oregon and Washington reported about 48,000 manufacturing workers in 1951. Of this total, about 22,000 were working in lumber, pulp and paper mills, and other wood products plants; about 5,000 were working in meat and fish packing and fruit and vegetable processing plants; and nearly 22,000 were working in plants producing aluminum and other goods.

The pulp mills located at Geras, Longview, and Vancouver, in Washington; and St. Helens in Oregon; have a combined capacity of 2222 tons of pulp per day, of which 1,145 tons are sulfate, 760 tons are sulfite, and 297 tons are ground wood pulp. The paper mills have a combined capacity of 1,261 tons of paper per day.

The bulk of the sawmill industry is concentrated in the vicinity of Portland, Longview, and Vancouver. Maximum production of these plants was more than 2 billion board feet of lumber during the early years of World War II.

Aluminum plants located at Troutdale, Oregon, and Vancouver and Longview, Washington, had a combined capacity of 373 million pounds

annually in 1951. Prior to the Korean war, these plants were producing about 30 percent of the Nation's primary aluminum.

Fish canneries located principally at Astoria, Oregon, and meat packing and fruit and vegetable processing plants located in the Portland-Vancouver area process raw products shipped in from surrounding areas, as well as those produced in the basin. Data on manufacturing are shown in Table 15 of the Appendix.

Hydroelectric Power Production

Cheap hydroelectric power produced in plants with a combined capacity of about 655,000 kilowatts has been responsible for much of the recent industrial development along the lower Columbia River. The Bonneville Dam plant, first of the large Federal projects constructed in the Pacific Northwest, represents about 79 percent of the installed capacity of the basin's existing plants. Two additional Federal and one private utility plant now under construction in the basin will increase the capacity of hydroelectric plants by about 2,172,000 kilowatts. An additional project, the John Day Dam, authorized for construction by the Corps of Engineers, the builders of the other Federal projects, will add 1,105,000 kilowatts more power to this great Columbia River development. When completed, the four Federal projects, all located on the main stem of the Columbia River in this basin, will have a combined capacity of 3,932,000 kilowatts with provisions for installation of additional units at distant future dates. Data on existing and authorized hydroelectric projects, and those under construction, are shown in Table 16 of the Appendix.

This additional hydroelectric power which will be distributed through the Northwest Power Pool will be available for use throughout the Pacific Northwest. However, it is expected that many new industries will locate along the Columbia River to take advantage of easy means of transportation of raw materials and have access to the ocean for world trade.

Transportation

This basin is favorably located with relation to transportation facilities. Railroads and highways leading from the centers of population to the interior and surrounding areas, and water transportation from upper reaches of the basin connect with ocean-going vessels which now use the river system to the Portland-Vancouver area. Adequate air transportation facilities are also available. Columbia River commerce in 1950 amounted to about 17 million tons. Data on Columbia River commerce are shown in Table 17 of the Appendix.

Recreation

The Columbia Gorge, with its picturesque waterfalls and deep-cut rock formations, the Columbia River, the snow-capped mountain peaks, and the many beautiful forests are well-known natural attractions to tourists from all parts of the country. In order that they may be enjoyed, and full benefit obtained from these natural attractions, many facilities have been developed by Federal, State and local agencies, and private individuals. These include lodges, recreation residences, and other overnight and camping facilities; boat moorages; picturesque highways; and winter sports areas. More than 3,472,000 people visited the recreational areas and used these facilities during 1950.

The most popular area from the standpoint of visitors was Mt. Hood, which was visited by 720,000 people. Many of these were winter sports enthusiasts who went there to ski on its beautiful snow-covered slopes. Many others went there during the summer and winter for vacations, staying at Timberline Lodge or in the recreational residences. The second most popular area was Columbia Gorge, where 658,800 people were reported as having visited the beautiful overlooks and crests, 643,600 Bonneville Dam, and 455,000 the waterfalls and springs along the river. Data on recreation are shown in Table 18 of the Appendix.

In addition to the winter sports, vacationing and sightseeing activities, which are world famous and of tremendous economic importance, the area offers other attractions. The Astoria, Ilwaco, and Warrenton salmon fishing derbies draw thousands of people to the lower river area during the annual fall runs of these fish. Pleasure boating is a favorite pastime. Fleets of sailboats, yachts, and speedboats are maintained and are entered in regattas, water skiing and other events.

Of lesser importance to outsiders, but of great importance to local people are the many excellent sports-fishing waters and hunting areas. Waterfowl, upland game birds, deer, elk and black bear are plentiful throughout the basin. Salmon, trout, and smelt fishing are most popular and there is some fishing for sturgeon, bass, crappie and catfish, which are found in various waters of the basin.

PROBLEMS AND SOLUTIONS

INTRODUCTION

General

The Columbia River below the Yakima drains a number of tributaries (the Snake and the Willamette River excluded), the combined flow of which is very much smaller than that of the main stem. Also unlike the Columbia, which has an enormous summer flow, most of these tributaries are subject to wide seasonal variations of flow which are greatly accentuated by irrigation diversions during the normal low flow season. As a result, the problems of water pollution in this basin are often local to the tributary. For this reason the main stem and each tributary have been treated separately in sub-sections following this introduction.

The seasonal variation of flow in many streams and the fact that those with continuous flows lie in deep canyons have made the occurrence and volume of ground water important factors in the settlement and utilization of land in this basin. Although the quality of ground water is good, dependable large supplies lie at great depth under much of the basin. On the plateaus east of the Cascades, the slight precipitation, the great depth to ground water, and the inadequacy or inaccessibility of surface waters have made the provision of adequate water supplies a major problem, particularly in the rural areas. Until heavy well-drilling equipment became available, most farmers hauled water for domestic and livestock use. Water now obtained from deep wells in these areas is too costly for irrigation use, but most communities and industries dependent upon ground water have been able to obtain satisfactory supplies. In the Deschutes River Sub-basin large springs maintain adequate year-round flows in the main river and some of its tributaries. Water from some of these springs is used directly for domestic and agricultural purposes and power generation.

Water pollution control is an essential part of the comprehensive plan for the conservation and development of the water resources of the Columbia River Basin. In the main stem of the Columbia River, pollution control will be needed to assure safe water supplies for potential municipal and industrial purposes and recreational uses and to protect the fishery resources. In tributary streams where the natural flows and additional flows available from future storage will be needed for irrigation, pollution control will be necessary to avoid damage to domestic, industrial, agricultural, and other water uses. It is, therefore, very important that the water pollution control programs in these sub-basins be kept in step with the water resource developments.

Basic data on sources of municipal and industrial pollution are shown in Tables K and L, pages 97 to 101. Tables A through I, pages 20 through 25, statistically summarize these data.

The requirements for municipal and industrial water pollution abatement are treated in detail in the sub-sections devoted to the main stem and tributaries. An alphabetic listing of needs by cities and towns for the basin as a whole is given in Table J, page 27.

Tables 11, 14, 16, 17, 18, 19, 20, and 21 of the Appendix contain information regarding the uses of the basin's resources for irrigation, fish propagation, hydroelectric power, navigation, recreation, and municipal and industrial water supply.

Water Quality Objectives

The water pollution control program for the basin has two principal objectives. These are: (1) to preserve the present high quality of water in unpolluted streams, consistent with reasonable and beneficial future developments; and (2) to restore polluted waters to a level of quality suitable for present and foreseeable future uses. While the abatement and control of water pollution from municipal and industrial sources will restore waters now polluted to a level of quality suitable for present and future usage, it will be necessary for agricultural and forestry interests to cooperate in order to prevent deterioration of the present quality of water in many streams.

Needs for pollution abatement and prevention are based on the present and foreseeable future uses of the water resources of the basin and the water quality objectives of the States of Oregon and Washington. The principal present uses of the water resources are for domestic, industrial and agricultural water supply, navigation, hydroelectric power production, commercial fishing, fish and wildlife propagation and recreation. The water resources development program of the Columbia River Basin, now underway, will be responsible for a large increase in usage for most of the above purposes. Water quality objectives for most of these uses have been prepared and adopted by the Pollution Control Council, Pacific Northwest Area. This council is an informal group composed of representatives from the pollution control agencies of the States of Idaho, Montana, Oregon and Washington, the Territory of Alaska, the Province of British Columbia and representatives from the Public Health Service and the Canadian National Health and Welfare Department. These water quality objectives are included in Table M, following page 31.

Although these water quality objectives have not been formally adopted by the Oregon State Sanitary Authority and the Washington Pollution Control Commission, many of the objectives are presently being used by both agencies.

Watershed Protection

Watershed uses such as logging, road construction, mining and farming have, in a number of locations, caused the quality of water in streams to deteriorate rapidly. Sediment from erosion of the watershed land and from flood-borne debris and channel bankcutting causes high turbidity in the water and carries valuable fish spawning gravels. Municipalities and industries which obtain their water supplies from streams in these locations have been required to provide costly water treatment facilities. In order to preserve the excellent quality of water in those streams where the watersheds have not been damaged, it will be necessary for agricultural, forestry and mining interests to cooperate in the pollution control program. Government agencies representing agriculture, forestry and mining have developed programs and specifications for the control of erosion in watersheds where those operations are undertaken. These government agencies will require the use of erosion control measures on public lands and will furnish assistance to operators on privately owned lands.

TABLES

Tables A through I summarize the basic data on sources of municipal and industrial pollution shown in Tables K and L on pages 97 to 101.

Table J lists by towns and cities the needs for abatement of municipal and industrial pollution for the basin.

Table M shows the uniform water quality objectives prepared and adopted by the Pollution Control Council, Pacific Northwest Area.

TABLE A
SOURCES OF POLLUTION--MUNICIPAL*

State	Sources of Pollution in Number of Municipalities	Population Served by Sewerage Systems	Amount of Pollution Discharged to Water-courses (In terms of equivalent number of people)**
Oregon in Basin	35	173,900	141,230
Willamette River Basin	<u>60</u>	<u>497,820</u>	<u>744,965</u>
Subtotal--Oregon	95	671,720	886,195
Washington	<u>34</u>	<u>118,730</u>	<u>168,465</u>
Totals	129	790,450	1,054,660

* Includes incorporated or unincorporated municipalities; other legal bodies, as sanitary districts, towns, significant institutions, military establishments, or other population centers.

** Includes industrial wastes discharged into the municipal sewerage system.

TABLE B
SOURCES OF POLLUTION--INDUSTRIAL*

State	Sources of Pollution (in number of plants)		Amount of Pollution Discharged to Water- courses (in terms of equivalent number of people)**
	Producing Organic Wastes	Producing Inorganic Wastes	
Oregon in Basin	66 ^{1/}	5	492,495
Willamette River Basin	44 ₋	4	2,802,600
Subtotal--Oregon	109 ^{2/}	9	3,295,095
Washington	59 ^{3/}	8	2,516,634
Totals	163 ^{4/}	17	5,811,729

* Industries having separate outlets discharging wastes directly to watercourses.

** Refers only to organic wastes.

1/ Includes 1 plant also producing inorganic wastes.

2/ Adjusted to correct for duplication noted in footnote 1/

3/ Includes 5 plants also producing inorganic wastes.

4/ Adjusted to correct for duplication noted in footnotes 1/ and 3/.

TABLE C
EXISTING TREATMENT FACILITIES
MUNICIPAL

Degree of Treatment Provided	Number of Municipalities* Served	Number of Treatment Plants	Population Served
Primary	19 ^{1/}	19	154,620
Secondary	26	26	70,090
No treatment	24 ^{2/}	--	67,920
Totals	69	45	292,620

* Includes incorporated or unincorporated municipalities; other legal bodies, as sanitary districts, towns, significant institutions, military establishments, or other population centers.

1/ Includes 3 minor treatment plants such as septic tanks.

2/ Includes one military establishment and one municipal port authority (Population variable).

TABLE D
EXISTING TREATMENT FACILITIES
INDUSTRIAL*

Type of Industry	Number of Plants	No. of Industrial Plants Having	
		Treatment Facilities	No Treatment Facilities
Food & Kindred Products:			
Meat Products	40	23	17
Fish Products	19	14	5
Canning & Preserving	14	12	2
Dairy Products	8	2	6
Fruit Packing	5	3	2
Distilleries	2	2	0
Grain Elevators	4	2	2
Malting	1	0	1
Flour Milling	1	1	0
Paper & Allied Products:			
Pulp & Paper	5	3	2
Paperboard & Other Products	5	2	3
Lumber & Wood Products	10	6	4
Primary Metal Industries	3	3	0
Fabricated Metal Products	2	1	1
Ore Processing	1	1	0
Stone & Clay Products	1	0	1
Products of Petroleum	1	1	0
Chemicals & Allied Products	4	3	1
Textile Mills	3	0	3
Mining	1	0	1
Shipbuilding	1	0	1
Rendering Plant	<u>1</u>	<u>1</u>	<u>0</u>
Totals	132	80	52

* Industries having separate outlets discharging wastes directly to watercourse.

TABLE E
ADEQUACY OF EXISTING TREATMENT FACILITIES

Existing Treatment Facilities	Number of Treatment Facilities	Adequacy with Relation to			
		Capacity		Operation	
		Satisf.	Unsatisf.	Satisf.	Unsatisf.
Municipal	45	37*	8	36**	9
Industrial	85***	<u>71</u>	<u>14</u>	<u>70</u>	<u>15</u>
Total	130	108	22	106	24

- * Includes 3 facilities with unsatisfactory operation.
 ** Includes 2 facilities with unsatisfactory capacity.
 *** Includes 2 treatment plants at each of 3 industrial establishments.

TABLE F
PROGRESS IN CONSTRUCTION OF POLLUTION ABATEMENT FACILITIES

Year	Municipal		Industrial	
	Plants Completed	Design Population	Waste Treatment Plants Completed	Amounts of Wastes Treated (in Equivalent No. of People)
1946	0	---	0	---
1947	3	7,500	4	76,000
1948	0	---	2	1,250,300
1949	3	23,000	5	460,800
1950	3	44,500	4	1,243,000
1951	6	115,200	4	576,000
1952	<u>6</u>	<u>26,400</u>	<u>10</u>	<u>102,000</u>
Total	21	216,600	29	3,908,100

TABLE G
WASTE TREATMENT NEEDS--MUNICIPAL*

Needs**	Number			Population Served by Facilities		
	Ore.	Wash.	Total	Ore.	Wash.	Total
New Plant	6	13	19	17,850	31,970	48,920
Enlargement or Additions to Existing Plant	1	3	4	100,000	28,300	128,300
Replace Existing Plant	2	1	3	1,250	620	1,870
Connect to Municipal Sewer System	0	3	3	---	7,000 ^{1/}	7,000
Improve Operation and Maintenance	1	2	3	1,200	23,400	27,600
Sewers & Treatment Plant	<u>7</u>	<u>5</u>	<u>12</u>	<u>---</u>	<u>---</u>	<u>---</u>
Subtotal	17	27	44	120,300	90,390	210,690
No Project Required	<u>25</u>	<u>12</u>	<u>37</u>	<u>53,600</u>	<u>28,340</u>	<u>81,940</u>
Total	42	39	81	173,900	118,730	292,630

* Includes incorporated or unincorporated municipalities; other legal bodies, as sanitary districts, towns, significant institutions, military establishments, or other population centers.

** Individual project needs are listed in Tables J and K, pages 26 and 97, respectively.

^{1/} Does not include the variable population of one military establishment and one port authority.

TABLE H
INDUSTRIAL* WASTE POLLUTION ABATEMENT NEEDS

Needs**	Number		
	Oregon	Washington	Total
New Treatment Plant or Other Pollution Control Measures	11	25	36
Enlargement, Additional Treatment, or Improved Operation	4	13	17
Replace Existing Plant	1	0	1
Connection to Municipal Sewer System	<u>16</u>	<u>5</u>	<u>21</u>
Subtotal	32	43	75
No Project Required	<u>37</u>	<u>36</u>	<u>73</u>
Total	69	79	148

* Industries having separate outlets discharging wastes directly to watercourse.

** Some industrial establishments included may have two or more treatment needs depending upon the number of separate plants operated and the method of disposal of sanitary wastes. Such industries have been included under the appropriate heading for the major industrial waste treatment need. For individual project needs refer to Table J and Table L, pages 26 and 99, respectively.

TABLE I
CURRENT STATUS OF ACTION ON POLLUTION ABATEMENT NEEDS

Status of Action	Number of Municipalities	Number of Industries
Inactive	30	65
Active Planning	11	10
Final Plans Approved	0	0
Under Construction	<u>5</u>	<u>0</u>
Total	46	75

TABLE J
POLLUTION ABATEMENT NEEDS

Name	Type of Wastes to be Treated	Requirements
OREGON PROJECTS		
Arlington	Domestic	Primary treatment plant
Athens	- - - -	
Preston-Shaffer Milling Co.	Grain washings	Replacement of existing treatment facilities
Bend	Domestic	Replacement of existing treatment facilities
Canyon City	Domestic	Sewers & secondary treatment plant
Clatskanie	Domestic	Primary treatment plant
Dee	- - - -	
Oregon Lumber Co.- Hardwood Division	White water	Fiber recovery plant
Fairview	Domestic	Sewers & primary treatment plant
Government Camp	Domestic	Sewers & primary treatment plant
Heppner	- - - -	
Morrow County Creamery	Dairy products	New treatment facilities or other pollution control measures
Hood River	Domestic	Primary treatment plant
Apple Growers' Assn.	Cannery	Additional treatment
Hood River Distillery	Distillery	New treatment facilities or other pollution control measures
Madras	Domestic	Sewers & primary treatment plant
Maupin	Domestic	Replacement of existing treatment facilities
Pendleton	- - - -	
Pendleton Canning & Frozen Foods	Cannery	Enlargement of existing treatment facilities
Portland	Domestic	Additions to existing primary treatment facilities
Armour & Co.	Meat Products	Connect to city sewer
Associated Meat Packers	Meat Products	Connect to city sewer
B & B Hog Feeding Ranch	Organic	Connect to city sewer
Branders Meat Co.	Meat Products	Connect to city sewer

(Continued)

TABLE J -- POLLUTION ABATEMENT NEEDS (CONTINUED)

Name	Type of Wastes to be Treated	Requirements
OREGON PROJECTS (Continued)		
Portland (Continued)		
Columbia Pickle Co.	Food pre-serving	New treatment facilities or other pollution control measures
Columbia Wool Scouring Co.	Textile	Connect to city sewers
Clem Ponta Hog Feeding Farm	Organic	Connect to city sewers
Electric Metallurgical Co.	Inorganic	New treatment facilities or other pollution control measures
Gem Meat Co.	Meat Products	Connect to city sewers
J & C Cervetto Hog Feeding Farm	Organic	Connect to city sewers
Kenton Packing Co.	Meat Products	Connect to city sewers
Pacific Meat Co.	Meat Products	Connect to city sewers
Pete Wess Hog Feeding Farm	Organic	Connect to city sewers
Portland Provision Co.	Meat Products	Connect to city sewers
Portland Rendering Co.	Meat Products	Connect to city sewers
Portland Union Stockyards	Organic	New treatment facilities or other pollution control measures
Stearn & Welch Meat Co.	Meat Products	Connect to city sewers
Swift & Co.	Meat Products	Additions to existing treatment facilities
Tony Cervetto Hog Feeding Farm	Organic	Connect to city sewers
Western States Rendering Co.	Meat Products	Connect to city sewers
Prairie City	Domestic	Sewers & secondary treatment plant
Prairie Creamery Co.	Dairy Products	New treatment facilities or other pollution control measures
Rainier	Domestic	Primary treatment plant
Redmond	Domestic	Sewers & primary treatment plant
St. Helens	Domestic	Primary treatment plant
Fir-Tex Insulating Board Co.	Paper board & other wood products	New treatment facilities or other pollution control measures
St. Helens Pulp & Paper Co.	Pulp & paper products	New treatment facilities or other pollution control measures
The Dalles	Domestic	Primary treatment plant
Seufert Bros. Co.	Fish & fruit cannery	New treatment facilities or other pollution control measures

(Continued)

TABLE J -- POLLUTION ABATEMENT NEEDS (CONTINUED)

Name	Type of Wastes to be Treated	Requirements
OREGON PROJECTS (Continued)		
Troutdale	Domestic	Sewers & primary treatment facilities
Bissinger & Co.	Textile	New treatment facilities or other pollution control measures
Weston	- - - -	
Lamb-Weston, Inc.	Canning	Additional treatment facilities
Wood Village	Domestic	Improved operation

TABLE J
POLLUTION ABATEMENT NEEDS

Name	Type of Waste to be Treated	Requirements
WASHINGTON PROJECTS		
Battleground	Domestic	Sewers & primary treatment facilities
Clark Co. Dairymen's Cooperative	Dairy Products	New treatment facilities or other pollution control measures
Cliff Holmes Bingen	Poultry Packing Domestic	Primary treatment plant Sewers & primary treatment facilities
Camas Crown Zellerbach Corp.	Domestic Sulfite & kraft pulp Sanitary	Primary treatment plant Additional waste liquor & fiber recovery facilities Connect to city sewers
Castle Rock Cathlamet	Domestic Domestic	Primary treatment facilities Sewer extensions and primary treatment facilities
Chinook Chinook Packing Co.	----- Fish products	New treatment facilities or other pollution control measures
College Place	Domestic	New secondary treatment facilities (under const.)
Dayton	Domestic	Enlarge existing treatment facilities & improve operations
Goldendale Goldendale Meat Co.	----- Meat Products	Additional treatment facilities
Klickitat Pine Box Co.	Lumber & wood products	Connect to city sewers
Ilwaco Keystone Packing Co.	Domestic Fish products	Primary treatment plant New treatment facilities or other pollution control measures
Kalama Columbia Veneer Co.	Domestic Lumber & wood products Sanitary	Primary treatment plant Improved operations Primary treatment plant
New England Fish Co.	Fish products	Additions to existing waste treatment facilities
Kelso Central Smelt Co.	----- Fish products	New treatment facilities or other pollution control measures

(Continued)

TABLE J -- POLLUTION ABATEMENT NEEDS (CONTINUED)

Name	Type of Waste to be Treated	Requirements
WASHINGTON PROJECTS (Continued)		
Longview	Domestic	Primary treatment plant
Port of Longview	Domestic	Connect to city sewers
Longview Fiber Co.	Pulp & paper products	Additional treatment facilities
Continental Grain Co.	Sanitary Grain washing	Primary treatment plant New treatment facilities or other pollution control measures
Longview Meat Packing Co.	Sanitary Meat Products	Primary treatment facilities Additions to existing facilities
Long Bell Lumber Co.	Sanitary	Primary treatment facilities
Pacific Paperboard Co.	Paper and paper products	Additions to existing facilities
Weyerhaeuser Co.	Sanitary	Primary treatment facilities
Reynolds Aluminum Co.	Sanitary	Improved operation
Morton	Domestic	Improved operation
North Bonneville	Domestic	Sewers & primary waste treatment facilities
Pasco	Domestic	Primary treatment facilities (under construction)
Big Pasco Army Warehouse Area	Domestic	Connect to city sewers
Ridgefield	Domestic	Primary treatment facilities
Stevenson	Domestic	Primary treatment facilities
Toledo	Domestic	Primary treatment facilities
Lewis Co. Gravel Operations	Mining	Settling ponds & improved operations
Underwood	----	
Underwood Fruit & Warehouse Corp.	Sanitary	Primary treatment plant
Vader	Domestic	Primary treatment plant
Vancouver (treated)	Domestic	Improved operation
(untreated)	Domestic	Connect to municipal system
Vancouver Shipyards	Sanitary	Connect to city sewers
Pacific Building Materials Co.	Sanitary	Connect to city sewers
Vancouver Industrial Sewer	-----	
Archer Daniels Midland Co.	Grain washing	New treatment facilities or other pollution control measures
Great Western Malting Co.	Malting	New treatment facilities or other pollution control measures
Mill Print Inc., Plant #9	Sanitary	Improved operation
	Sanitary	Primary treatment facilities

(Continued)

TABLE J -- POLLUTION ABATEMENT NEEDS (CONTINUED)

Name	Type of Waste to be Treated	Requirements
WASHINGTON PROJECTS (Continued)		
Vancouver (Continued)		
Vancouver Industrial Sewer (Continued)		
Vancouver Plywood Co.	Lumber & wood	New treatment facilities or other pollution control measures
Columbia River Paper Mill	Sanitary	Connect to city sewers
Fir Specialties Corp.	Pulp & paper	Waste liquor recovery
Carborundum Co.	Sanitary	Primary treatment facilities
	Inorganic	New treatment facilities or other pollution control measures
Aluminum Co. of America	Sanitary	Primary treatment facilities
General Chemical Co.	Inorganic	New treatment facilities or other pollution control measures
Walla Walla	Domestic	Enlarge existing plant
Walla Walla College	Domestic	Enlarge or replace existing treatment facilities
Emory Stubblefield Co.	Rendering plant	Improved operations
Washougal	Domestic	Sewers and primary treatment facilities
Washougal Woolen Mills	Textile	New treatment facilities or other pollution control measures
Winlock	Sanitary	Primary treatment facilities
	Domestic	Replace existing treatment facilities
Wishram	Domestic	Primary treatment facilities
Woodland	- - - -	
Weedman Lumber Co.	Sawmill	Improved operations
Wyman Lumber Co.	Sawmill	Additions to existing facilities
Woodland Valley Packing Co.	Meat products	Additions to existing facilities
Yacolt	Domestic	Primary treatment facilities

COLUMBIA RIVER MAIN STEM

The Columbia River enters the basin at mile 335, the mouth of Yakima River. The upper 25 miles are entirely within the State of Washington. The river bends abruptly near the Oregon-Washington boundary and flows westerly to the Pacific Ocean through the lower 310 miles of its course. In this latter stretch it is the boundary between Oregon and Washington. Through the Cascade and Coast mountain ranges the river has cut deep and picturesque gorges. The river varies in width from a few hundred feet at some of the rapids to $6\frac{1}{2}$ miles at the tidal estuary and has an average width of about 2,000 feet. The volumes of flows in this stretch are adequate for present and foreseeable future needs. Low flows occur from September through March, and high flows from April through August. At The Dalles gauging station, which records the run-off from about 92 percent of the area in the Columbia River Basin, the mean annual flow is 194,000 second feet on the basis of the 71 year record, 1878 through 1949. During low-water periods, the river between the mouth of the Snake River and Celilo Falls contains 16 rapids which have a total length of 20 miles.

Water resource developments in this stretch of river include Bonneville Dam, completed, and McNary and The Dalles dams under construction. These dams are primarily navigation and power projects. A fourth dam, the authorized John Day Project, will be needed to complete the lower river development.

Water uses in the lower Columbia River are of major importance in the economic development of the Pacific Northwest.

Present and Future Uses of Water Resources

Municipal Water Supply:

Columbia River water is used by three communities in Oregon and three in Washington, serving a total population of 23,900. Pasco and Kennewick, Washington, obtain their supplies from the river in the upper stretch, a few miles below the Hanford Atomic Energy Plant. Kennewick obtains its water through an infiltration gallery, and Pasco filters its water. Both cities chlorinate the water prior to use. McNary, Oregon, and North McNary, Washington, the temporary communities built up by McNary Dam construction, obtain their supplies from the river about 35 miles below Pasco. Both of these communities filter and chlorinate the water. Arlington, Oregon, located about 50 miles downstream from McNary Dam also treats Columbia River water by filtration and chlorination prior to use. The small community of Clifton, Oregon, located on the river about two miles above Astoria, uses Columbia River water for domestic purposes after treatment by chlorination.

Thirteen Oregon communities and nine Washington communities in the basin use ground water supplies. These 22 supplies furnish the domestic needs of about 71,800 people.

Present indications are that future use of Columbia River water for municipal purposes will be expanded, particularly in the lower valley where the tributary streams now used by some communities are barely able to meet present requirements.

In the Portland metropolitan area there are 39 municipal water systems serving about 650,000 people. The locations of these systems are shown on Map No. 7. The water requirements and supply capacities of principal systems are shown in Table 21 of the Appendix.

Industrial Water Supply:

Columbia River water is used by industries located at Arlington, St. Helens, Wauna, Astoria and Warrenton in Oregon; and Hedges, Camas, Vancouver, and Longview in Washington. The Crown Zellerbach Corporation of Camas and Weyerhaeuser Timber Co. of Longview, requiring water of high quality for processing purposes, provide treatment before use. The Allied Chemical and Dye Co. of Hedges uses untreated water for processing purposes. Fifteen other industries located on the main stem, eleven in Oregon and four in Washington, use untreated Columbia River water for cooling, washing, and other purposes. The Pacific Building Materials Co. of Vancouver washes trucks with untreated water obtained from the river near the Vancouver Veterans Hospital sewer outfall.

Thirty-one industries located along the Columbia River use ground water supplies. Eleven of these are located in Oregon and 22 in Washington.

In the Portland Metropolitan area 48 industries have private water supplies. The locations of these industries are shown on Map No. 7. The water requirements and supply capacities of the largest users are shown on Table 21 of the Appendix.

Industrial expansion along the Columbia River may ultimately cause overdevelopment of ground water resources. This will result in expanded usage of the river water.

Agricultural Water Supply:

Lands presently irrigated along the main stem of the Columbia River aggregate only about 3,850 acres. The developments are scattered and for the most part are supplied with water by pumping from the river or from wells.

Proposed developments will provide pumping facilities to deliver Columbia River water for supplemental irrigation of 1,500 acres and for a full supply to irrigate 179,730 acres.

The use of Columbia River water for livestock is not important.

Fish and Wildlife:

All of the anadromous fish spawned in Columbia River and tributaries must pass through some stretch of the main stem. At Celilo Falls the Indians fish commercially during a portion of the year and for their own use during periods closed to commercial fishermen. Commercial salmon and smelt fishermen using gill nets operate principally in stretches of the river below Bonneville Dam. Upon completion of The Dalles Dam, commercial fishing for salmon is expected to be reduced or eliminated from the Columbia River above Bonneville Dam. Salmon, smelt, sturgeon, steelhead, and cutthroat trout are favorite catches of sports fishermen. These and many other species propagate in the main stem and depend upon its water and aquatic life for existence.

Ducks and geese use the main stem for resting during migration and for nesting purposes. Some of the islands in the river, and adjacent land areas in the lower valleys and waters above Bonneville Dam are now wildlife reserves. Some of the land purchased for construction of McNary and The Dalles dams will be developed and utilized for waterfowl production. Additional river areas will be maintained in wildlife reserves.

Bathing and Other Recreation:

The sandy beaches of the Columbia River are used for bathing during the summer months. None of these has been developed or is controlled. All stretches of the river are used for boating, fishing, camping, and picnicking. The hunting of waterfowl in areas not closed to this sport is a favorite activity during the open season. Fishing for salmon is probably the favorite outdoor sport offered by the waters of the main stem. The Astoria and Warrenton, Oregon, and Ilwaco, Washington, salmon derbies attract annually to the lower river thousands of fishermen from all sections of the country. Many fine yachts and boats are moored on the Columbia River at Astoria, Longview, and Portland; and racing, cruising, and related water sports are popular. The famous Columbia Gorge offers many scenic attractions to tourists and campers. The Columbia Gorge Recreational Area contains many parks and developed camp sites to accommodate these people.

The Dalles and McNary dams, now under construction, will attract many additional tourists to the area and will require the construction of recreational and overnight facilities to accommodate them. Impoundments back of the dams will be used extensively for boating and other recreational activities.

Navigation:

Between the mouth of the Columbia River and Vancouver, Washington, channel dimensions are adequate for ocean commerce. Barges now transport commodities between Vancouver and the Pasco-Kennewick area.

In the future a deep water channel will be provided as far upstream as The Dalles, Oregon, and the dimensions above The Dalles will be sufficient for operation of shallow draft river boats. Locks will be provided at all of the dams to facilitate movement of transport facilities.

Logs are transported up and down the river and boomed in areas adjacent to the saw and pulp mills and other woods products plants.

Pollution Contributed to Water Resources

Basic data on sources of municipal and industrial pollution are included in Tables K and L on pages 97 to 101. These sources include 33 cities, towns, and other sewered areas, and 60 industrial establishments which discharge their wastes to the Columbia River or adjacent sloughs and bays. Wastes having a total population equivalent of 2,829,300 are discharged by these 93 municipalities and industries.

The municipal sources of pollution are listed as follows:

Oregon

McNary*	Portland*
Umatilla*	St. Helens
Arlington	Rainier
Wasco*	Clatskanie
The Dalles	Tongue Point Housing Project*
Hood River	Tongue Point Naval Station*
Wood Village*	Astoria
Multnomah County Farm Home*	Astoria Riverwood Park
Portland Airport*	Warrenton

Washington

Kennewick*	Vancouver*
Pasco**	Vancouver - Fourth Plain School*
Big Pasco--Army Warehouse Area	Kalama
North McNary*	Longview
Wishram*	Port of Longview
White Salmon*	Cathlamet
Stevenson	Ilwaco
Camas	

* Provides treatment prior to discharge.

** Treatment plant under construction.

Significant industrial sources of pollution, including only those establishments which have separate outlets, are listed as follows:

Oregon

Doan Slaughterhouse,* The Dalles	Oregon Fur Growers,* Astoria
Beaudoin & Sons,* The Dalles	New England Fish Co.,* Astoria
Seufert Bros. Co., The Dalles	Barbey Packing Co.,* Astoria
Hood River Distillery, Hood River	Columbia River Salmon Co.,*
Apple Growers Assn.,* Hood River	Astoria
Reynolds Aluminum Co.,* Troutdale	Sebastian-Stewart Fish Co.,*
Swift & Co.,* Portland	Astoria
Portland Union Stockyards, Portland	Union Fisherman's Coop.,* Astoria
Columbia River Packers Assn.,*	Van Camp Seafood Co.,* Astoria
Astoria (#1)	Bioproducts of Oregon,* Warrenton
Columbia River Packers Assn.,*	San Juan Fish Co.,* Warrenton
Astoria (#2)	Seaside Clam Co.,* Warrenton
	Point Adams Packing Co.,* Hammond

Washington

Bailey Poultry,* Kennewick	Columbia River Paper Mill,
North Pacific Grain Growers,*	Vancouver
Kennewick	Columbia River Paper Co., Sawmill,
Twin City Livestock & Poultry Co.,*	Vancouver
Kennewick	Columbia Winery,* Vancouver
Continental Grain Growers,* Pasco	Fir Specialties Corp., Vancouver
Nelson Packing Co.,* Pasco	Pacific Building Materials Co.,
Allied Chemical Corp.,* Hedges	Vancouver
Underwood Fruit & Warehouse Corp.,	Evergreen Packing Co.,* Vancouver
Underwood	General Chemical Co.,* Vancouver
Washougal Woolen Mills, Washougal	Carborundum Co.,* Vancouver
Mt. Norway Poultry Co.,* Washougal	Aluminum Co. of America,* Vancouver
Crown Zellerbach Corp.,* Camas	Cloverdale Coop. Berry Assn.,*
Vancouver Shipyards, Vancouver	Kalama
Archer Daniels Midland Co.,	Columbia Veneer Co.,* Kalama
Vancouver	New England Fish Co.,* Kalama
California Packing Corp.,*	Longview Fiber Co.,* Longview
Vancouver	Continental Grain Co., Longview
Great Western Malting Co.,*	Long Bell Lumber Co.,* Longview
Vancouver	Reynolds Aluminum Co.,* Longview
Millprint, Inc., Plant #9,	Weyerhaeuser Timber Co.,* Longview
Vancouver	Interstate Packers Assn.,* Longview
Washington Cannery Coop.,*	Chinook Packing Co., Chinook
Vancouver	Keystone Packing Co., Ilwaco
Vancouver Plywood Co.,* Vancouver	Ilwaco Fish Co., Ilwaco
Valley Farms, Vancouver	

* Has waste prevention, recovery or other pollution abatement measures.

Fifty-three of the industrial plants listed produce organic wastes and seven produce inorganic wastes. Five of the plants producing inorganic wastes also discharge sanitary wastes.

Damages to Water Resources from Pollution

Bacterial pollution in the river below the major population centers is relatively high due to the discharge of untreated sewage. This is particularly true in the river below Vancouver and Longview, Washington, and St. Helens and Portland, Oregon.

Stream surveys conducted by the Washington Pollution Control Commission and Oregon State Sanitary Authority during the summer of 1951 and the City of Portland during the past four years indicate the general level of bacterial contamination in the river. On the Washington side of the river below Vancouver and Longview, Washington coliform counts averaging 80,000 and 45,000 per 100 ml. respectively were found. On the Oregon side of the river tests were made both prior to and after installation of the outlet from Portland's new sewage treatment plant. These tests indicate a considerable increase in coliform bacteria since the beginning of operation of Portland's plant; however, until all of the sewage from the City of Portland is taken out of the Willamette River, treated and discharged into the Columbia no definite results will be available. In these studies, bacterial contamination was also found to be excessive below St. Helens, Oregon, and in bays near Camas, Cathlamet and Ilwaco, Washington.

Sphaerotilus growths in the river below Camas, Vancouver and Longview, Washington, have been interfering with gill net operations. Release of Sphaerotilus masses from log rafts in Camas Slough have particularly aggravated conditions for clogging gill nets. Extensive growth of Sphaerotilus was found in the river during the 1951 surveys from two miles above Vancouver, Washington, to below Longview. After installation of waste diffusion outlets by two of the industries at Longview, considerable improvement was noted in conditions in the river below Longview. The paper industries at Camas have also installed a diffuser outlet which will undoubtedly reduce growth of Sphaerotilus in Camas Slough and in the main channel also. Wastes from saw mills entering the river above Bonneville Dam have interfered with the operation of screens and other facilities at the dam and fish hatchery.

The overflow from septic tanks in the communities of Bingen, North Bonneville and Washougal in Washington, are causing local nuisances and polluttional conditions.

Pollution Prevention Measures in Effect

Of the 33 municipalities having sewer systems, fifteen have treatment facilities and one has a plant under construction. These sixteen municipalities are as follows:

McNary, Oregon	Kennewick, Washington
Umatilla, Oregon	Pasco, Washington*
Wasco, Oregon	North McNary, Washington
Wood Village, Oregon	Wishram, Washington
Multnomah County Farm Home, Oregon	Vancouver, Washington
Portland Airport, Oregon	Vancouver - Fourth Plain School
Portland, Oregon	White Salmon - Washington
Tongue Point Naval Station, Oregon	
Tongue Point Housing Proj., Oregon	

* Plant under construction.

All of these plants have been constructed within the past ten years. With the exception of the plants at Portland and Wood Village, Oregon, and Vancouver and Wishram, Washington, all plants are of adequate capacity and are being operated satisfactorily.

The Portland plant does not provide facilities for sludge drying and disinfection. The Wood Village plant needs improvements in operation and maintenance. The Vancouver plant will be of adequate capacity only after separation of storm water from the sanitary sewage. This program is now under way and is scheduled for completion during 1953. Wishram needs a new plant to replace the outdated septic tank now in use.

Forty-four of the 60 industries with separate outlets have installed waste treatment, recovery or other facilities which prevent or reduce pollution of watercourse. Twenty-three of these have installed facilities since 1946. Although a large percentage of the industrial establishments have facilities which reduce the pollution load discharged to the river, only the following thirty provide adequate treatment for all their wastes at the present time.

Oregon

Doan Slaughterhouse, The Dalles	Barbey Packing Co., Astoria
Deaudoin & Sons, The Dalles	Columbia River Salmon Co., Astoria
Reynolds Aluminum Co., Troutdale	Sebastian-Stewart Fish Co., Astoria
Columbia River Packers Assn., Astoria (#1)	Union Fisherman's Coop., Astoria
Columbia River Packers Assn., Astoria (#2)	Van Camp Sea Food Co., Astoria
Oregon Fur Producers, Astoria	Bioproducts of Oregon, Warrenton
New England Fish Co., Astoria	San Juan Fish Co., Warrenton
	Seaside Clam Co., Warrenton
	Point Adams Packing Co., Hammond

Washington

Bailey Poultry, Kennewick
North Pacific Grain, Kennewick
Twin City Livestock & Poultry,
Kennewick
Continental Grain Co., Pasco
Nelson Packing Co., Pasco
Allied Chemical Corp., Hedges
Mt. Norway Poultry Co., Washougal
Columbia Winery, Vancouver

California Packing Corp., Vancouver
Washington Cannery Coop., Vancouver
Evergreen Packing Co., Vancouver
Cloverdale Coop. Berry Assn., Kalama
Interstate Packers Assn., Longview
Ilwaco Fish Co., Ilwaco

The Weyerhaeuser Timber Co., Longview, has recently converted its sulfite pulp mill to a magnesium oxide base plant and burns the waste sulfite liquor. This company also has recently constructed a waste diffusion outlet into the main channel of the Columbia River. The Longview Fiber Co., Longview, the Crown Zellerbach Corp., Camas, and the Columbia River Paper Mills, Vancouver, also have recently constructed waste diffusion outlets into the main channel of the river. Although these facilities have materially reduced the pollution load and improved conditions in the river, additional waste treatment or other pollution control measures are required to handle the large volume of industrial and sanitary wastes from these plants. A number of the other industrial establishments adequately treat a portion of their wastes but lack full scale facilities.

Pollution Prevention Measures Required

Water pollution control in the main Columbia River is necessary to maintain a quality of water adequate for public and industrial use, to protect the health of the many thousands of people who use the river for recreational purposes and to avoid any additional hazards to the fishery resources. The program for prevention of pollution is as follows:

OREGON MUNICIPALITIES

ARLINGTON (Pop. 680) -- A sewage treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

THE DALLES (Pop. 7,680) -- Industrial wastes equivalent to a population of about 3,000 are presently being discharged into the municipal sewers. A treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

HODD RIVER (Pop. 3,700) -- A treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

TROUTDALE (Pop. 514) -- A sewer system and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

WOOD VILLAGE (Pop. 1,200) -- This housing project is served by a secondary treatment plant of adequate capacity. Improvements are needed in the plant's operation and maintenance.

FAIRVIEW (Pop. 438) -- A sewer system and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

PORTLAND (Pop. 373,600) -- The Portland municipal sewerage system serves a total population of 394,000. The combined population equivalent of domestic and industrial wastes discharged to the sewerage system is 503,000. About one-fifth of the total waste is presently being treated in Portland's new sewage treatment plant, the effluent from which is discharged to the Columbia River. The remaining wastes are being discharged to the Willamette River. Portland has nearly completed a 17 million dollar pollution abatement program. Some of the interceptors and pumping stations remain to be completed. It is anticipated that by the middle of 1954, most of the wastes now being discharged to the Willamette River will be treated at the new plant and discharged into the Columbia River. The new plant does not provide facilities for the drying of sludge and the disinfection of the effluent.

ST. HELENS (Pop. 4,700) -- A treatment plant of a type which will provide an equivalent of primary treatment with disinfection of the effluent should be constructed.

RAINIER (Pop. 1,290) -- A treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

CLATSKANIE (Pop. 901) -- A treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

ASTORIA (Pop. 12,300) -- This city discharges its wastes into the main channel of the Columbia River about five miles above the mouth of the river. As no swimming takes place on the Oregon side of the river below Astoria and no water uses are affected by wastes, treatment does not appear to be needed at the present time.

ASTORIA - RIVERWOOD PARK (Pop. 650) -- At the present time treatment of the sewage from this development is not required.

WARRENTON (Pop. 1,900) -- At the present time treatment of the sewage from Warrenton is not required. Because of high ground water conditions, drainage from individual septic tanks flows onto streets and other lower areas. The sewer system should be extended to the entire city to take care of this unsatisfactory condition.

WASHINGTON MUNICIPALITIES

PASCO (Pop. 10,200) -- The city officials have recognized the need for waste treatment facilities for several years. The municipal waste treatment program has been delayed due to negotiations between the city and the Army for a plant site on the property of the Big Pasco Army Warehouse Depot property. A final decision on a plant site was reached in the fall of 1952 and contracts were awarded in April for the construction of a primary waste treatment plant with chlorination of effluent. This plant is now under construction.

BIG PASCO--ARMY WAREHOUSE DEPOT (Pop. variable) -- The agreement mentioned above between the City of Pasco and Army provided for the discharge of wastes from the depot into the municipal sewer system.

WISHRAM (Pop. 350 est.) -- The sewer system should be extended and a new treatment plant which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed to replace the inadequate septic tank now in use.

BINGEN (Pop. 736) -- A sewer system and a treatment plant which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

STEVENSON (Pop. 580) -- A treatment plant of a type which will provide an equivalent of primary treatment with disinfection of the effluent should be constructed.

NORTH BONNEVILLE (Pop. 560) -- A sewer system and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

WASHOUGAL (Pop. 1,600) -- A sewer system and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

CANAS (Pop. 4,700) -- The sewerage system should be extended and a storm water separation program initiated. A treatment plant of a type which will provide the equivalent of primary treatment and disinfection of the effluent should be constructed. Provision should be made in the treatment plant design for treating the sanitary wastes from the Crown Zellerbach Corporation plants.

VANCOUVER (Pop. 41,600) -- Interceptors, now under construction, should be completed in order that the McLoughlin Heights and other sewer areas can be connected to the sewage treatment plant. The sewerage system should be extended. A storm water separation program now under construction will reduce the volume of wastes now received at the treatment plant. The effluent from the treatment plant should be disinfected.

KALAMA (Pop. 1,100) -- The sewerage system should be extended and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

LONGVIEW (Pop. 20,300) -- Industrial wastes equivalent to a population of 3,200 are discharged into the municipal sewers. The sewerage system should be extended and a treatment plant of sufficient capacity to handle both the domestic and industrial wastes and of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be provided.

PORT OF LONGVIEW (Pop. variable) -- A treatment plant of a type which will provide the equivalent of primary treatment with effluent disinfection should be constructed or the municipal system should be extended to include the port.

CATHLAMET (Pop. 620) -- A treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

ILWACO (Pop. 720) -- A treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

OREGON INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum standards of purity and the general requirements for the disposal of sewage and industrial wastes as adopted by the Oregon State Sanitary Authority.

SEUFERT BROTHERS CO., The Dalles (Pop. equivalent of wastes 3,000) -- A treatment plant or other suitable waste disposal facilities should be provided.

HOOD RIVER DISTILLERY, Hood River (Pop. equivalent of wastes 10,000) -- A treatment plant or other suitable waste disposal facilities should be provided either by the industry or jointly with the city of Hood River.

APPLE GROWERS ASSN., Hood River (Pop. equivalent of wastes 40,000) -- Additional treatment facilities or other suitable disposal measures should be provided either by the industry or jointly with the city of Hood River.

SWIFT AND CO., Portland (Pop. equivalent of wastes 50,000) -- Facilities for the removal of all floating and settleable solids from the industrial wastes should be provided.

PORTLAND UNION STOCKYARDS, Portland (Pop. equivalent of wastes 1,000, of sanitary wastes 30) -- Facilities for the removal of all floating and settleable solids from the industrial wastes should be provided. A septic tank or other suitable disposal facility for sanitary wastes should also be provided.

SAWMILLS -- In accordance with Oregon State Law, all saw mills should provide facilities to prevent sawdust, bark, and other debris from entering the water.

WASHINGTON INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum requirements for industrial waste prevention adopted by the Washington Pollution Control Commission whether or not the plant is connected to a municipal sewerage system.

UNDERWOOD FRUIT & WAREHOUSE CORP., Underwood (Pop. equivalent of sanitary wastes 40) -- A septic tank or other suitable treatment facilities for sanitary wastes should be provided.

WASHOUGAL WOOLEN MILLS, Washougal (Pop. equivalent of wastes 450; of sanitary wastes 122) -- A treatment plant or other suitable disposal facilities should be provided for industrial wastes. A treatment plant or other suitable treatment facilities for sanitary wastes should also be provided.

CROWN ZELLERBACH CORP., Camas (Pop. equivalent of wastes 1,500,000, of sanitary wastes 900) -- This company discharges wastes from sulfite, kraft, and ground wood pulp mills; a paper mill; and from sanitary facilities at these plants. A waste diffusion outlet has been constructed into the main channel of Columbia River for discharge of concentrated waste liquors and wash waters from the sulfite mills. While this method of discharging wastes has definitely improved conditions, recovery facilities for the sulfite waste liquors are necessary for solution of the waste disposal problem.

The kraft, ground wood, and paper mills dispose of wastes into Camas Slough. The kraft mill should increase the efficiency of recovering its cooking chemicals. The ground wood and paper mills should provide facilities for increasing fiber recovery. A connection should be made to sewers of the city of Camas for disposal of sanitary wastes when the city constructs its treatment plant.

VANCOUVER SHIPYARDS, Vancouver -- A connection to the sanitary sewers of Vancouver should be provided for the disposal of sanitary wastes.

PACIFIC BUILDING MATERIALS CO., Vancouver -- A connection to the sewers of the city of Vancouver or other suitable facilities for disposal of sanitary wastes should be provided.

ARCHER DANIELS MIDLAND CO., Vancouver -- This plant is presently connected to an industrial sewer owned by the city of Vancouver. Facilities should be provided for removal and suitable disposal of suspended matter in plant wastes, and for prevention of accidental spills entering the sewer.

GREAT WESTERN MALTING CO., Vancouver (Pop. equivalent of wastes 5,200; of sanitary wastes 40) -- This plant is connected to the Vancouver industrial sewer. Facilities should be provided for removal and proper disposal of suspended matter in the industrial waste. A septic tank or other suitable disposal facilities for sanitary wastes should be provided.

MILLPRINT, INC., PLANT #9, Vancouver -- This plant is connected to the Vancouver industrial sewer. A septic tank or other suitable treatment facilities for the sanitary wastes should be provided.

VANCOUVER PLYWOOD CO., Vancouver (Pop. equivalent of sanitary wastes 130) -- This plant is connected to the Vancouver industrial sewer. A connection to the sanitary sewers of Vancouver or other suitable facilities for disposal of sanitary wastes should be provided. Treatment facilities or other waste preventive or reduction measures should be provided for the organic and inorganic industrial wastes.

COLUMBIA RIVER PAPER MILL, Vancouver (Pop. equivalent of wastes 431,000) -- This company discharges wastes from a sulfite mill which has recently been changed to the ammonia base process. A waste diffusion outlet has just been completed which will diffuse the wastes into the main channel of the Columbia River. While this method of discharging wastes will definitely improve conditions, especially those which have caused heavy growths of sphaerotilus to foul up the commercial fishermen's nets, recovery facilities for the concentrated waste liquors are necessary for the solution of the waste disposal problem.

COLUMBIA RIVER PAPER CO. SAWMILL, Vancouver (Pop. equivalent of sanitary wastes 50) -- A septic tank or other suitable treatment facilities for sanitary wastes should be provided.

FIR SPECIALTIES CORP., Vancouver -- A septic tank or other suitable treatment facilities for sanitary wastes should be provided.

CARBORUNDUM CO., Vancouver (Inorganic wastes) -- Facilities should be provided to recover or neutralize liquid inorganic wastes now being discharged to the Columbia River.

ALUMINUM COMPANY OF AMERICAN, Vancouver (Pop. equivalent of sanitary wastes 430) -- A treatment plant of a type which will provide the equivalent of primary treatment with effluent disinfection should be constructed for disposal of sanitary wastes.

GENERAL CHEMICAL CO., Vancouver (Inorganic wastes) -- Facilities should be provided to recover or neutralize liquid inorganic wastes now being discharged to the Columbia River.

COLUMBIA VENEER CO., Kalama (Pop. equivalent of industrial wastes unknown - sanitary wastes 90) -- Facilities should be provided for removal and suitable disposal of suspended matter in plant industrial wastes. A septic tank or other suitable treatment facilities for sanitary wastes should also be provided.

NEW ENGLAD FISH CO., Kalama (Pop. equivalent of wastes 220 -- Screening facilities should be installed on all drains. All offal should be collected and disposed of in a suitable manner.

LONGVIEW FIBER CO., Longview (Pop. equivalent of wastes 216,000; of sanitary wastes 570) -- This company has recently constructed a waste diffusion outlet into the main channel of the Columbia River for disposal of kraft and paper mill wastes. While the recovery processes and waste diffusion outlet have substantially improved conditions in the river, continuous efforts should be made to increase the efficiency of the recovery processes in the kraft mill. Adequate facilities for recovery of fiber losses in wash waters should be provided.

A treatment plant of a type which will provide the equivalent of primary treatment with effluent disinfection for sanitary wastes should be constructed.

CONTINENTAL GRAIN CO., Longview -- Facilities should be provided for removal and suitable disposal of suspended matter in plant wastes and for prevention of accidental spills entering the sewer. A septic tank or other suitable treatment facilities for sanitary wastes should be provided.

LONG BELL LUMBER CO., Longview (Lumber Mill Pop. equivalent of sanitary wastes 400) -- A treatment plant of a type which will provide the equivalent of primary treatment of sanitary wastes with effluent disinfection or a connection to the city of Longview sewers should be constructed.

REYNOLDS ALUMINUM PLANT, Longview (Sulfite & kraft pulp mills pop. equivalent of sanitary wastes 120) -- A treatment plant of a type which will provide the equivalent of primary treatment with effluent disinfection for sanitary wastes should be constructed.

WEYERHAEUSER TIMBER CO., Longview (Pop. equivalent of wastes 360,000; of sanitary wastes 200) -- This company disposes of sulfite and kraft pulp mill and sanitary wastes into the Columbia River. The sulfite mill has recently been converted to a magnesium oxide base process and is burning a major portion of the waste liquors for recovery of chemicals and heat.

A waste diffusion outlet serving both the sulfite and kraft mills has recently been constructed which permits these wastes to be dispersed in the main channel of the Columbia River. While the recovery processes and the waste diffusion outlet have substantially improved conditions in the river, continuous efforts should be made to increase the efficiency of recovery processes in both the sulfite and kraft mills. Adequate facilities for recovery of fiber losses in wash waters should be provided.

A treatment plant of a type which will provide the equivalent of primary treatment with effluent disinfection for sanitary wastes should be constructed.

CHINOOK PACKING CO., Chinook (Fish processor pop. equivalent of wastes 670) -- Screening facilities should be installed on all drains. All offal should be collected and disposed of in a suitable manner.

KEYSTONE PACKING CO., Ilwaco (Fish processor pop. equivalent of wastes 1,250) -- Screening facilities should be installed on all drains. All offal should be collected and disposed of in a suitable manner.

SAW MILLS -- All saw mills should provide facilities to prevent sawdust, bark, and other debris from entering the water. The minimum requirement adopted by the Washington Pollution Control Commission should be strictly complied with in all cases.

WALLA WALLA RIVER

The Walla Walla River is an interstate stream located in eastern Oregon and Washington, between the Snake and Umatilla river watersheds. It has its source on the western slopes of the northern end of the Blue Mountains and flows westerly, entering the Columbia River near Wallula, Washington. The entire flow of the river is used for irrigation during the late summer months.

Present and Future Uses of Water Resources

Municipal Water Supply:

The headwaters of Mill Creek, the Touchet River, and the South Fork of Walla Walla River are used as sources of water supply for Walla Walla and Dayton, Washington, and Milton-Freewater, Oregon. A total population of 31,850 is served from these sources. Three smaller communities in Oregon and seven in Washington are supplied from ground water sources. These communities have a total population of 8,725.

The only treatment necessary for the Walla Walla supply at the present time is chlorination. The Dayton and Milton-Freewater supplies are filtered and chlorinated. Continued use of these streams for municipal water supply is necessary as it is very difficult and expensive to obtain adequate supplies from ground water sources.

Industrial Water Supply:

There are no separate industrial water supplies taken from surface sources. Four industries in Oregon use wells to supplement supplies obtained from municipal sources, and one industry in Washington uses well water for cooling purposes.

Agricultural Water Supply:

At present about 16,000 acres in Oregon and 22,000 acres in Washington are irrigated. As no storage is provided, it is necessary to augment natural stream flows by pumping from wells in many locations. An adequate supply of water is not available for much of the area currently irrigated. The main river below Milton-Freewater and most of the tributaries are used for livestock watering.

Proposed reservoir storage will make all of the normal flows available for irrigation. This will provide a supplemental water supply for 40,400 acres and a full supply for an additional 34,000 acres of land.

Fish and Wildlife:

There is presently a fair-sized steelhead run in the Walla Walla River to the spawning gravels in main stem and tributaries above Milton-Freewater. As further development of the river for irrigation takes place, the plans of the State Game Commission call for complete screening of the diversions as a primary step in rehabilitating the runs of anadromous fish. Most stretches of the main river and tributaries are now used for propagation of sports fish. Upland game birds, deer and elk are abundant in the agricultural and forested areas. Large numbers of ducks and geese pass through the area during periods of migration.

Recreation:

Swimming in streams of the area is not important. However, hunting, fishing, camping and winter sports are engaged in by residents and visitors. The Walla Walla water supply watershed is closed to these activities, but other streams are used extensively.

Pollution Contributed to Water Resources

Basic data on sources of municipal and industrial pollution are included in Tables K and L on pages 97 to 101. These sources include eight cities, towns, and other sewered areas, and nine industrial establishments which are not connected to municipal sewers.

Because of the great demand for water to irrigate the fertile valley lands, industrial waste waters are at a premium in this basin. Treated municipal wastes are also used for irrigation. Wastes from six industries and the treated wastes from one municipality are piped directly to farm lands. A portion of the wastes from one other industry is also used for irrigation. The treated wastes from seven municipalities and seepage from a lagoon at one industrial establishment are the only wastes entering the watercourses. These wastes have a population equivalent in excess of 84,870 after treatment.

The municipal sources of pollution are listed as follows:

<u>Name</u>	<u>State</u>	<u>Disposal of Treatment Plant Effluent</u>
Milton-Freewater	Oregon	Farm land
Farm Labor Camp	Washington	Mill Creek
Walla Walla College	Washington	Mill Creek
Walla Walla	Washington	Mill Creek
Walla Walla Gov. Plant	Washington	Mill Creek
College Place	Washington	Mill Creek
Dayton	Washington	Touchet River
Waitsburg	Washington	Touchet River

Overflows from individual septic tanks and private sewers enter Mill Creek from the unsewered community of College Place, Washington. Sewage from the unsewered community of Weston, Oregon, enters Pine Creek through private sewers and by the overflow of septic tanks.

The industrial wastes from those industries which are not connected to municipal sewers are disposed of as follows:

<u>Name</u>	<u>Location</u>	<u>Method of Waste Disposal</u>
Rogers Canning Co.	Milton-Freewater, Oregon	Farm land
Umatilla Canning Co.	Milton-Freewater, Oregon	Farm land
Umatilla Canning Co. Freezing Plant	Milton-Freewater, Oregon	Farm land
Smith Frozen Foods	Milton-Freewater, Oregon	Farm land
Utah Canning Co.	Milton-Freewater, Oregon	Farm land
Lamb-Weston Inc.	Weston, Oregon	Lagoon and farm land
Pictsweet Foods, Inc.	Waitsburg, Washington	Farm land
Joe B. Baker Packing Co.	Walla Walla, Washington	Mill Creek
Emory Stubblefield	Walla Walla, Washington	Mill Creek

At Walla Walla and Dayton, Washington, an attempt has been made to treat cannery wastes combined with the domestic sewage in the municipal plants. The treatment, however, has not been successful because of the heavy pea processing wastes imposed upon these plants during the cannery season. The canneries located at Walla Walla are constructing a pipe line to carry the wastes directly to farm lands and Dayton has the same plan under consideration.

Damages to Water Resources from Pollution

During the canning season the waters of Mill Creek and the Walla Walla River below the outlet of the Walla Walla municipal treatment plant are grossly polluted. The treatment plant overloaded with pea cannery wastes is unable to provide a satisfactory degree of treatment. As a result, the effluent from the plant, which receives very little dilution in the receiving waters, creates nuisance conditions and causes bacterial contamination. The water which is later diverted for irrigation is potentially unsafe.

Conditions similar to those occurring in Mill Creek and the Walla Walla River exist in the Touchet River below Dayton. This pollution is caused by inadequately treated effluents from the Dayton and Waitsburg plants. Pea cannery wastes discharged into the sewerage system at Dayton are causing the most trouble at the present time. Touchet River water is also diverted for irrigation.

Seepage into Pine Creek at Weston, Oregon, from the lagoon of the Lamb-Weston Corporation cannery is causing serious pollution in this stream.

Pollution Prevention Measures in Effect

All of the municipalities in the basin have secondary treatment plants, or will have when the plant at College Place, now under construction, is completed. Principally due to overloading, the treatment plants at Walla Walla and Dayton are providing inadequate treatment.

Six of the industries not connected to municipal sewers are disposing of their wastes in a satisfactory manner on farm land. The plant of the Lamb-Weston Corporation at Weston disposes of a portion of its wastes in an improperly constructed lagoon. The remainder of the wastes of this plant is disposed of on farm land. The Emory Stubblefield Company rendering plant at Walla Walla treats its wastes in a grease tank and septic tank prior to disposal.

Pollution Prevention Measures Required

Because of low flows which occur in the main river and tributaries during late summer months, and the fact that all available water resources will continue to be utilized for irrigation, it is necessary for all municipalities to provide secondary treatment with effluent disinfection. It does not appear to be economical for municipalities to treat pea cannery wastes along with the domestic sewage because of the terrific peak loads imposed upon the treatment plants by these wastes, which occur for only one or two months each year. The canneries must, therefore, dispose of their wastes by irrigation, lagooning, or provide treatment prior to discharge into the municipal sewers.

The program for pollution abatement in the Walla Walla basin is as follows:

MUNICIPALITIES

WALLA WALLA, Wash. (Pop. 24,100) -- Industrial wastes equivalent to a population of 290,000 are presently being discharged into the municipal sewers during the canning season. The capacity of the municipal plant should be increased sufficiently to handle the domestic sewage and off irrigation season industrial wastes discharged into the city sewers. Effluent disinfection should be provided. Plans are almost complete for the modernization of the existing municipal treatment plant and provisions have been completed for the disposal of the wastes from three pea canneries by construction of an industrial sewer to irrigated lands.

DAYTON, Wash. (Pop. 2,980) -- Industrial wastes equivalent to a population of 54,800 are presently being discharged into the municipal sewers during the canning season. The municipal plant at Dayton should be improved by the addition of a final clarifier, more dependable operation, and disinfection of the effluent. Disposal of the pea cannery and other vegetable processing wastes now discharged to the municipal sewers, by irrigation, lagooning, or other means is necessary for adequate operation of this treatment plant. Washington State College has been making an efficiency study of the existing plant. The results of this study will be used in revamping the treatment facilities.

COLLEGE PLACE, Wash. (Pop. 3,170) -- A sewerage system and a treatment plant of a type which will provide the equivalent of secondary treatment with disinfection is under construction.

INDUSTRIES

All industries in the Washington portion of the basin should provide the necessary facilities to comply with the minimum requirements for industrial waste prevention adopted by the Washington Pollution Control Commission whether or not the plant is connected to a municipal sewerage system.

All industries in Oregon should provide the necessary facilities to comply with the minimum standards of purity and the general requirements for disposal of sewage and industrial wastes as adopted by the Oregon State Sanitary Authority.

LAMB-WESTON, INC., Weston, Ore. (Cannery) -- This plant is located on Pine Creek at Weston and discharges its wastes to a lagoon. A portion of the wastes, also, are used for irrigation. Present facilities are inadequate and seepage into pine Creek causes serious pollution. Additional land disposal facilities should be provided.

EMORY STUBBLEFIELD CO., Walla Walla, Washington -- This company needs to provide better operation of existing treatment facilities.

SAW MILLS -- In accordance with State laws, all saw mills should provide facilities to prevent sawdust, bark, and other debris, from entering the waters.

UMATILLA RIVER

The Umatilla River is located entirely within the State of Oregon. Its headwaters are on the northwest slope of the Blue Mountains in north-eastern Oregon. From its source the river flows westerly about 88 miles and joins the Columbia River about three miles downstream from McNary Dam. Elevations range from 5,500 feet, mean sea level, at the summit of the Blue Mountains, to about 250 feet at the Columbia River. The basin, which has a total drainage area of 2,290 square miles, contains rugged mountains in the headwater areas and fertile plains adjacent to the lower reaches.

Waters of the Umatilla River are used primarily for irrigation. The recorded minimum and average annual flow of about 171 and 503 second-feet respectively are principally from run-off in winter and spring floods between irrigation seasons. At times during the irrigation season, the lower reaches of the stream are dry.

Present and Future Uses of Water Resources

Municipal Water Supply:

Surface waters are not used directly for domestic purposes by any of the communities in this sub-basin. Pendleton uses Umatilla River water obtained from infiltration galleries and then chlorinated for its supply during a portion of the year. Wells and a spring are used to supplement this supply during low flows and flood periods.

In addition to the 12,000 people supplied with water from Pendleton's waterworks, a total of 7,985 people residing in eight smaller communities use ground water from wells for domestic purposes.

Industrial Water Supply:

Seven industries located in the basin have their own water supplies. All of these excepting one use wells: The Harris Pine Mills plant at Pendleton uses Umatilla River water for cooling purposes.

Agricultural Water Supply:

About 37,000 acres of land are presently irrigated. Most of this acreage is supplied with water from the main stem Umatilla River; however, some acreages are supplied from tributary streams. The Bureau of Reclamation has constructed two reservoirs, total capacity about 124,000 acre feet, to supplement natural flows. This stored water is available to most of the lands irrigated from the main stem. Developments on

tributary streams have no storage and are entirely dependent upon natural flows. During the summer months all available supplies, including return flows, are utilized for irrigation. Projects with access to storage usually have a sufficient supply, but those without storage are usually short of water during the late summer months.

Proposed irrigation developments include two projects which will supply stored water to an additional 32,500 acres of land.

Because of the great depth to ground water and expense of constructing wells, much of the livestock raised in the area is dependent upon surface water.

Fish and Wildlife:

Umatilla River formerly supported heavy runs of spring chinook salmon and steelhead trout. The salmon runs have been largely depleted but the annual run of steelhead to this river approximates 6,000. The river is potentially capable of supporting a sizeable run of salmon provided that irrigation diversions are screened and minimum flows are maintained. Upper reaches of the main stem and tributaries support resident trout.

The agricultural areas support upland game birds and provide feeding and nesting areas for waterfowl. Deer and elk inhabit the mountainous forested areas.

Recreation:

Hunting, fishing, and camping in the higher forested mountain areas are the most popular recreational activities of local residents and attract tourists and vacationists. During the summer, temperatures are higher than in most sections of the State and outdoor bathing would be popular if the lakes and streams were adaptable to this use. Present low water flows and the fact that reservoirs are drawn down rapidly during the irrigation season, however, make those waters unattractive, and very little use is made of them for outdoor bathing.

Pollution Contributed to Water Resources

Basic data on sources of municipal and industrial pollution are included in Tables K and L, pages 97 to 101. These sources include six cities and other sewered areas and four industrial establishments. Wastes from these ten sources have a population equivalent after treatment of about 45,500.

The municipal sources of pollution are listed as follows:

<u>Name</u>	<u>Receiving Stream</u>
Athena	Wildhorse Creek
Pendleton	Umatilla River
Airbase Housing	Umatilla River
Stanfield	Umatilla River
Ordinance	Land
Hermiston	Drainage Ditch

At Pendleton, pea cannery wastes are pretreated prior to discharge to the municipal sewers.

The industrial sources of pollution, including only those industries with separate outlets, are listed as follows:

<u>Name</u>	<u>Location</u>	<u>Disposal</u>
Pendleton Canning & Frozen Foods	Pendleton	Umatilla River
Preston-Shaffer Milling Co.	Athena	Wildhorse Creek
Rogers Canning Co.	Athena	Farm land
Perry Bros.	Stanfield	Farm land

Damage to Water Resources from Pollution

Domestic sewage and industrial wastes discharged into the river at Pendleton has caused serious pollution, particularly during the canning season when most of the flow is diverted for irrigation. The polluted waters are also diverted for irrigation use. The municipal treatment plant at Pendleton is being improved to provide an adequate degree of treatment.

The overflow from individual septic tanks and wastes from the Preston-Shaffer Mill are seriously polluting the water in Wildhorse Creek below Athena.

Pollution Prevention Measures in Effect

Ordinance and the Umatilla Indian Agency have primary treatment plants. Pendleton, Pendleton Air Base Housing Project, Stanfield and Hermiston have secondary treatment plants. Athena has a secondary treatment plant under construction and nearly complete. The city of Pendleton, in addition, has constructed a primary treatment plant for pretreatment of cannery wastes. All of the municipal plants are of adequate capacity and are operated satisfactorily. The city of Pendleton is installing new facilities for secondary treatment.

The Rogers Canning Co. of Athena adequately disposes of its wastes on farm land. The Preston-Shaffer Milling Co., at Athena, and the Pendleton Canning and Frozen Foods Co., at Pendleton, have unsatisfactory disposal facilities.

Pollution Prevention Measures Required

Future water resource development plans indicate all available natural flows and stored waters will be used for irrigation purposes during the late summer months. This will require that the municipalities and industries located in the basin provide a high degree of treatment of their wastes.

The program for pollution abatement in the Umatilla River Basin is as follows:

MUNICIPALITIES

ATHENA (Pop. 750) -- A sewerage system and a treatment plant which will provide the equivalent of secondary treatment with disinfection of the effluent is under construction.

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum standards of purity and the general requirements for disposal of sewage and industrial wastes as adopted by the Oregon State Sanitary Authority.

PRESTON-SHAFFER MILLING CO., Athena (Pop. equivalent of wastes 1,400) -- A connection should be made to the Athena sewerage system or the existing industrial waste treatment works should be replaced with facilities which will provide the equivalent of secondary treatment.

PENDLETON CANNING AND FROZEN FOODS CO., Pendleton (Pop. equivalent of wastes 10,000) -- Seepage from the existing lagoons at this plant pollutes the waters of Wildhorse Creek and Umatilla River. Facilities for complete disposal of wastes on land should be provided.

SAW MILLS -- In accordance with Oregon State law, all saw mills should provide facilities to prevent sawdust, bark and other debris from entering the water.

WILLOW CREEK

Willow Creek drains an area of 890 square miles situated between the John Day and Umatilla River watersheds. It is a mountain stream, about 70 miles in length, which flows northerly from its source in the Blue Mountains to the Columbia River. The average annual flow of Willow Creek at the mouth is estimated to be about 28 second-feet. The flow, however, is quite variable, and the stream is often dry during the summer months.

Present and Future Uses of Water Resources

Municipal Water Supply:

The domestic water needs of about 2,100 people living in three small communities are supplied from wells.

Industrial Water Supply:

Two industries located in the basin have their own supplies. Both are from ground water sources.

Agricultural Water Supply:

About 3,000 acres of land are presently irrigated by direct diversion from Willow Creek. The water supply, however, is very inadequate. Proposed developments include storage reservoirs for flood control and supplemental irrigation use.

Fish and Wildlife:

Salmon do not migrate up Willow Creek because of its low flows. The headwaters, however, support trout. Waterfowl, upland game birds, deer, and elk are the principal kinds of wildlife inhabiting the basin.

Recreation:

Hunting and fishing are the principal recreation attractions within the basin.

Pollution Contributed to Water Resources

Basic data on sources of municipal and industrial pollution are included in Tables K and L of pages 97 to 101. There are two sources in this basin, one municipality and one industry, discharging wastes with a total population equivalent of about 400. A small part of the town of Heppner is served by a private sewer, with the remainder being unsewered at the present time. The Morrow Country Creamery, located at Heppner, disposes of milk wastes in Willow Creek.

Damages to Water Resources from Pollution

During the period of low stream flow sewage from the private sewer and wastes from a milk plant at Heppner create nuisance conditions in Willow Creek.

Pollution Prevention Measures in Effect

The community of Heppner has a sewer system and secondary treatment plant under construction and nearly complete at the present time.

Pollution Prevention Measures Required

As all available flows in Willow Creek are required for irrigation, it is necessary to provide a high degree of treatment for municipal and industrial wastes. The program for pollution abatement in the Willow Creek basin is as follows:

All industries should provide the necessary facilities to comply with the minimum standards of purity and the general requirements for disposal of sewage and industrial wastes as adopted by the Oregon State Sanitary Authority.

MORROW COUNTY CREAMERY, Heppner (Pop. equivalent of wastes 100) --
A connection should be made to the Heppner sewerage system when the treatment plant is installed.

JOHN DAY RIVER

The John Day River drains an area of 7,840 square miles in eastern Oregon extending from the Blue Mountain Divide on the east to the crest of the Ochoco Mountains on the west. The drainage area ranges in elevation from 155 feet above sea level at the Columbia River to 9,600 feet at the headwaters.

The basin is located in a semi-arid region, the average annual flow from which is about 1,950 second-feet. On some tributaries, practically the entire flow is diverted for irrigation during the growing season. Flows of the main river are quite variable, ranging from a minimum of 4 cubic feet per second to a maximum of 27,800 cubic feet per second observed at McDonald Ferry.

Present and Future Uses of Water Resources

Municipal Water Supply:

Because of the low flows occurring in most of the basin's streams during the irrigation season and high turbidities during flood period, the majority of communities depends upon deep wells or springs for domestic water supply purposes. Only two communities, Condon and Mitchell, use surface sources. Condon, the largest of these (population 1,000), has an auxiliary well supply. The population served from springs and wells is about 5,300.

Chlorination is the only treatment required at the present time for the Condon and Mitchell supplies obtained from Hay and Mill Creeks respectively.

Industrial water Supply:

There are seven industries located in the basin which have their own water supplies. Five of these obtain all or a portion of their supplies from surface sources. The other two industries use ground water supplies. Two of the industries with surface supplies also have wells or springs for supplemental use.

Agricultural Water Supply:

Irrigation developments by private interests constitute the chief agricultural use of waters of the basin. The present area irrigated is about 44,000 acres. Most of this land is irrigated by direct diversion from the river and streams, and usually is short of water during the late summer months.

Proposed development includes storage projects for supplemental irrigation of 23,100 acres and for a full supply to 233,500 acres of land located in the basin and along the Columbia River.

As ground water is available only at great depth throughout most of the area, considerable difficulty is encountered in providing adequate water for livestock.

Formerly, the John Day River supported large runs of anadromous fish. Although the runs of salmon have been practically eliminated, a few spring chinook continue to enter the stream. The steelhead run is small compared to the coastal streams but it has great value locally. Although gold dredging operations have rendered many of the spawning areas unsuitable for fish, the John Day is an important stream in plans for rehabilitation of the salmon and steelhead runs in the Lower Columbia tributaries.

Some of the tributaries support rainbow trout, which together with the steelhead are the principal species sought by sports fishermen.

The forested areas in the headwaters support deer and elk and the irrigated lands, upland game birds and waterfowl.

Recreation:

Principal recreational activities of the basin consist of hunting and fishing.

Pollution Contributed to Water Resources

Basic data on sources of municipal and industrial pollution are included in Tables K and L, pages 97 to 101. These include three municipalities and two industrial establishments discharging wastes with a total population equivalent of 670. The municipal sources of pollution include John Day, Fossil and Condon. John Day discharges treated wastes to the John Day River. Fossil discharges treated wastes to Cottonwood Creek and Condon discharges treated wastes to a dry drainage ditch.

The industrial sources of pollution are the Prairie Creamery Co., Prairie City, and the Dale Slaughterhouse of John Day. Wastes from the creamery are discharged to the John Day River, while the slaughterhouse wastes are lagooned and disposed of on land.

Damages to Water Resources from Pollution

Because of soil conditions, people living in the unsewered communities of Prairie City and Canyon City encounter difficulties in disposing of domestic wastes. Overflow from individual septic tanks causes nuisance conditions and contaminates surface waters in the vicinity of these communities.

Wastes from the milk plant at Prairie City cause objectionable conditions in the John Day River.

Pollution Prevention Measures in Effect

John Day, Fossil and Condon have secondary treatment plants which provide adequate treatment of the wastes from the present sewered communities.

The Dale Slaughterhouse of John Day disposes of its wastes in an adequate manner.

Pollution Prevention Measures Required

Because of the low flows which occur in the John Day River system during the late summer and early fall months, municipalities and industries are required to provide a high degree of waste treatment. The program for control of water pollution in the John Day Basin is as follows:

MUNICIPALITIES

PRAIRIE CITY (Pop. 820) -- A sewerage system and a treatment plant of a type which will provide the equivalent of secondary treatment and disinfection of the effluent should be constructed.

CANYON CITY (Pop. 510) -- A sewerage system and a treatment plant of a type which will provide the equivalent of secondary treatment and disinfection of the effluent should be constructed.

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum standards of purity and general requirements for disposal of sewage and industrial wastes as adopted by the Oregon State Sanitary Authority.

PRAIRIE CREAMERY CO., Prairie City (Pop. equivalent of wastes 100) -- Facilities for prevention of wastes or suitable disposal measures should be provided.

DESCHUTES RIVER

The Deschutes River heads on the eastern slopes of the Cascade Mountains in the northern part of Klamath County, Oregon. From its headwaters the river flows in a northerly direction about 170 miles through Deschutes, Wasco, Jefferson, and Sherman counties, and joins the Columbia River at a point about 17 miles upstream from The Dalles, Oregon. Its main tributary from the east is the Crooked River, which drains practically the entire county of Crook. The largest tributaries draining the Cascade Mountain slopes to the west are the Metolius, Warm Springs, and White rivers.

Run-off from the total drainage area of 10,500 square miles is remarkably uniform. The geological formations are porous in nature and act as underground reservoirs regulating run-off from the basin. Although stretches of the main river below Bend, the largest city in the basin, are nearly dry during the irrigation season, it picks up flow very rapidly at lower elevations, indicating a substantial underground flow. The average flow of the river near its mouth is 5,711 cubic feet per second, while the minimum flow of record is 3,380 cubic feet per second.

The economy of the Deschutes River Basin is highly dependent upon the development and use of the water resources of the river system. The good chemical quality, uniform flows, and low temperatures of the river water are particularly attractive for municipal, industrial and agricultural uses, and for the propagation of fish.

Present and Future Uses of Water Resources

Municipal Water Supply:

Obtaining sufficient water for domestic purposes has been a rather serious problem in the Deschutes Basin for many years. Although ground water can be obtained throughout much of the area, the cost of drilling through deep rock formations, the uncertainty of finding an aquifer, and the cost of pumping have discouraged the development of supplies from underground sources, especially for use on individual farms and ranches.

The waters of the upper river are extremely soft and contain little or no suspended matter. There are times, however, when they are heavily loaded with algae growths which produce objectionable tastes and odors.

The communities of Bend, Redmond, Sisters, Wamic, and the Warm Springs Indian Agency use surface sources of supply. The Bend supply is obtained from Tumalo Creek and requires only chlorination prior to use.

The city of Redmond uses water pumped directly from the Deschutes River during the winter months, and water from an irrigation ditch during the remainder of the year. Water pumped from the river requires only chlorination and storage, while that obtained from the irrigation ditch requires sedimentation, chlorination, and filtration. Sisters' supply is obtained from Squaw and Pole Creeks, and the Warm Springs Indian Agency's supply is obtained from Shitike Creek. Both supplies are chlorinated. Wamic uses raw water from an irrigation ditch. A total population of 16,010 is served by these five community water systems.

Springs or wells, or both, are used by Prineville, Moro, Shevlin, Maupin, Wasco, Grass Valley, Frieda, Terrebonne, and the Deschutes Valley Irrigation District which serves Madras. A total population of 8,120 is served by these water systems.

Industrial Water Supply:

There are nine industries located in the basin which have their own water supplies. Four lumber industries use surface water supplies without treatment, mainly for boiler feed water and cooling purposes. Two of the four have auxiliary city water. The remaining five industries use well water which is artesian at two locations.

Agricultural Water Supply:

Irrigation along the Deschutes River and tributaries is more highly developed than it is in most other areas draining to the lower Columbia River. A total of 107,800 acres are presently irrigated.

From the upper part of the basin the water stored in Crane Prairie Reservoir is used for irrigation near Bend and Redmond. The waters of the Wickiup Reservoir and the Crescent Lake Reservoir are used for irrigation of the areas near Madras and Tumalo respectively. Water stored in Ochoco Reservoir on Ochoco Creek, a tributary of Crooked River, is used for irrigation near Prineville. The four reservoirs have a combined storage capacity of about 370,000 acre feet. Some of the other streams where the natural flows are diverted for irrigation include Tumalo and Pole creeks, Squaw Creek below Sisters, Warm Springs and Whitewater rivers, Mill, Tenino, Shitike, Simnasho, Beaver, Frog and Clear creeks, and the North Fork of Crooked River.

The Warm Springs and Deschutes North Unit projects have been authorized for construction by the Bureau of Reclamation. The Wickiup Reservoir, a part of the North Unit Project, has been completed and work is underway on construction of the canals and laterals. These two projects will irrigate 56,500 acres of new lands. Proposed developments include facilities for supplemental irrigation of 62,690 acres and for a full supply for 41,420 acres of new lands.

Fish and Wildlife:

The Deschutes, Metolius and Warm Springs rivers support runs of spring chinook salmon and steelhead trout. Above the confluence of Squaw Creek which supports a run of summer steelhead, falls and dams block the migration of anadromous fish.

The Deschutes River supports numerous rainbow, cutthroat, and German brown trout, and is nationally known for its sport fishing. Some of the tributaries also support large numbers of resident trout.

The Deschutes River is one of the main streams included in the Lower Columbia River Fishery Development Program and will be further developed for use of anadromous fish. The Oregon Fish Commission has recently constructed and is now operating a salmon hatchery on the Metolius River.

Recreation:

The Deschutes River is one of the most popular fishing streams in the State of Oregon. It is more conveniently located to the larger centers of population than some of the other streams which also attract fishermen, and for that reason receives more intensive fishing. The river's spring-fed, cool waters are equally attractive to campers and for picnicking and boating. The sub-basin is also one of the better hunting areas of the State.

Pollution Contributed to Water Resources

In 1911 the Oregon State Legislature adopted a special statute which declared it to be unlawful to discharge into the Deschutes River, into any tributary thereof, or into any artificial canal or ditch carrying waters from said river, any sewage refuse, waste or polluting water, or other material which would in any manner impair the quality of the water for domestic or municipal purposes. This same statute was made a part of the Public Health Code by the State Legislature in 1919, and is now contained in the Oregon Compiled Laws Annotated, as Section 116-1138.

The Attorney General of the State of Oregon has ruled that this Statute does not prohibit the discharge into the sub-basin's water-courses of a properly treated and disinfected effluent from a treatment plant provided it does not corrupt or impair the quality of water in the receiving stream. As a result of this ruling by the Attorney General, permission has been given by the Oregon State Sanitary Authority to the Warm Springs Indian Agency and the City of Prineville to dispose of the effluents from secondary treatment plants into Shitike Creek and the Crooked River. Other communities in the area dispose of their wastes into sinkholes and underground caverns.

Basic data on municipal and industrial sources of pollution are included in Tables K and L, pages 97 to 101. Public sewerage systems which are in existence in the Deschutes Basin are those serving the communities of Gilchrist, Bend, Maupin, Prineville, the Warm Springs Indian Agency, and Moro. Data regarding these systems are as follows:

<u>Municipality</u>	<u>Population Served</u>	<u>Type of Treatment</u>	<u>Final Disposal</u>
Gilchrist	500	Primary	Lava sinkholes
Bend	1,000	Primary	Lava sinkholes
Maupin	400	Primary	Seepage pits
Prineville	250	Secondary	Crooked River
Warm Springs Indian Agency	3,000	Secondary	Shitike Creek
Moro	<u>300</u>	Primary	Lava sinkholes
Total	5,450		

The sewerage system at Bend (Population 11,500) serves only the main business section of the city. The remainder is served by individual septic tanks and drilled lava sinkholes. This latter type of disposal is also used by other unsewered communities in the basin.

There are six industrial sources of pollution in the basin. Data on these industries are as follows:

<u>Name</u>	<u>Location</u>	<u>Type of Waste</u>	<u>Treatment</u>	<u>Final Disposal</u>
Central Oregon Co-op	Redmond	Organic	Septic tank	Seepage pit
Cinder Butte Co.	Redmond	Organic	Lagoon	Seepage pits
N.W. Poultry & Dairy Products	Redmond	Organic	Lagoon	Seepage pits
Swift and Co.	Redmond	Organic	Lagoon	Seepage pits
Juniper Products	Sisters	Organic	Lagoon	Seepage pits
Dant and Russell	Frieda	Inorganic	Lagoon	Deschutes River

Damages to Water Resources from Pollution

Special laws, which have been on the statute books since 1911, have prevented any serious pollution of the waters of the Deschutes River System. During the war, when travel was restricted, there was a certain amount of swimming in the Deschutes River, near Bend. As a result, the City of Redmond, which obtains its public water supply from a canal diverting water from the river below the swimming pool, and several irrigation districts entered suit against the City of Bend and the Bend School District No. 1, in 1943. The complaint charged that

the defendants were polluting the Deschutes River (1) by operating a swimming pool in the river just above the diversion dam and intakes for the irrigation canals of the plaintiffs, and (2) by discharging street drainage and storm waters from the city of Bend into the river. In 1946, the case was referred to the Oregon State Sanitary Authority for a decision. In the meantime, however, the city of Bend and the School District agreed that no further swimming in the river would be sponsored or permitted by the defendants. The State Sanitary Authority also held a public hearing and, based on the facts presented, ruled that the City of Bend should do everything possible to dispose of its storm water and street drainage by sub-surface methods rather than discharge such wastes or waters into the river through storm sewers. The city now discharges its storm water and street drainage, as well as its domestic sewage, and industrial wastes, into lava sinkholes.

Additional legislation was adopted in 1945 to control pollution of waters in irrigation canals and make more effective a law passed in 1935, prohibiting washing or bathing in canals and irrigation ditches which supply water for household uses. As most of the people living in rural areas depend upon water obtained from the canals for domestic purposes, the 1935 law applies to the majority of canals and irrigation ditches in the basin.

In spite of the protection afforded by the statutes, natural pollution resulting from normal surface drainage from inhabited areas contaminates the waters in the river and irrigation canals to such an extent that they are unsafe for human consumption without first being subjected to some type of adequate purification treatment. As the population of the basin increases, the danger of drinking these waters will be increased.

Because of the peculiar geological formation in this area, it has been possible for years to dispose of most of the sewage and industrial wastes in underground caverns, called lava sinkholes. Thus far it has not been possible to determine the exact course of the subterranean rivers which flow through the lava formations. There is no assurance, however, that the discharge of wastes into these formations will not eventually cause pollution of the Deschutes River at some point downstream. The Opal Springs supply of the Deschutes Valley Water District, and the deep well supply at Terrebonne have during recent years shown indications of pollution and their waters are being chlorinated to make them safe for domestic use.

Pollution Prevention Measures in Effect

All of the communities having sewerage systems and all of the industries not connected to the municipal system provide some treatment of their wastes prior to final disposal. Two of the communities,

Prineville and the Warm Springs Indian Agency, have secondary treatment plants, and the other four, Gilchrist, Bend, Maupin, and Moro have primary plants. All of the industries, excepting one using a septic tank, use lagoons.

The Bend and Maupin plants are inadequate. The Maupin plant does not provide an adequate degree of treatment and needs enlargement. The Bend plant is obsolete and of insufficient capacity to treat the wastes from the entire city.

The six industrial establishments having separate outlets dispose of their wastes in a satisfactory manner.

Pollution Prevention Measures Required

Because present laws of the State of Oregon prohibit the discharge of polluting wastes into surface waters of Deschutes River Basin, municipalities and industries are required to give careful attention to their waste disposal problems. The laws provide sufficient penalties for any violations to make the controls effective and the irrigation districts have not shown any tendency to be lax in entering complaints. It appears to be quite likely that continued discharge of the growing population's sewage and industrial wastes into the underground caverns will lead to eventual pollution of the Deschutes River. For this reason, a carefully planned program for prevention of pollution should be established.

The program for prevention of water pollution in the Deschutes River Basin is as follows:

BEND (Pop. 11,400) -- The existing sewerage system should be expanded to include the entire city and the existing treatment plant replaced with a modern plant to provide at least primary treatment with effluent disinfection. The treatment plant effluents, storm water, and street drainage should be disposed of into the underground caverns through sinkholes.

MAUPIN (Pop. 312) -- The existing treatment plant at Maupin should be replaced with a modern plant of a type which will provide the equivalent of secondary treatment with disinfection of the effluent.

MADRAS (Pop. 1,260) -- A sewerage system and treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed. The treatment plant effluent should be disposed of into the underground caverns through sinkholes.

REDMOND (Pop. 2,950) -- A sewerage system and treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed. The treatment plant effluent should be disposed of into the underground caverns through sinkholes.

KLICKITAT RIVER

The Klickitat River rises in the Cascade Range in Washington and flows in a southerly direction along the eastern slope of these mountains to the Columbia River. The stream enters the Columbia in the Bonneville Pool. The drainage area of the Klickitat is 1,210 square miles.

Flows are well sustained, as the river drains mountain marshes and the glaciers of Mount Adams. The average annual flow to the Columbia River is estimated at about 1,560 cubic feet per second.

Present and Future Uses of Water Resources

Municipal Water Supply:

The community of Klickitat, having a population of 700, obtains its water supply from the Klickitat River. Prior to use the water is filtered and chlorinated. Goldendale, the largest municipality in the basin, serves a population of 2,100 with water obtained from springs.

Industrial Water Supply:

The Niels Lumber Co. of Klickitat is the only industry located in the basin which has its own supply. Water from the Klickitat River is filtered for use in this plant's operations.

Agricultural Water Supply:

About 7,250 acres of land are presently irrigated from natural flows of Klickitat River tributaries. Considerable use also is made of surface water for livestock watering.

Proposed irrigation developments in the basin are of relatively large scale. Because of the limited area within the basin suitable for irrigation, however, much of the potential acreage is outside the basin. Plans of the Bureau of Reclamation call for development of a supplemental water supply for 7,000 acres and a full supply for 13,000 acres located within the basin and 140,000 acres located in the Upper Horse Heaven Project which drains to the main stem of the Columbia River. The Bureau of Indian Affairs proposes to construct a storage reservoir on the Upper Klickitat River and a transmontane diversion to the Yakima River Basin. This latter development would provide a supplemental water supply for 15,700 acres and a full supply for 28,000 acres of new lands.

Fish and Wildlife:

The Klickitat River formerly supported good runs of spring chinook salmon and steelhead trout. It continues to support fair runs of these fish. No fall runs of anadromous fish are able to ascend the river because of falls near the mouth which are impassable at low water stages. Fish passage facilities are being built over the lower falls. The Klickitat River and most of its tributaries are of great sport-fishing value for steelhead trout, as well as resident rainbow and cut-throat trout.

The basin contains a wide variety of wildlife in the timbered and mountainous areas and on grazing and cultivated lands. The former is the principal habitat of deer, elk, bear, mountain goat, marten, beaver, and various species of grouse and quail. The latter areas support antelope, badger, mourning dove, sage hen, partridge, pheasant, and valley quail.

The Lower Columbia River Tributaries' Fishery Plan includes facilities for improvement of the Klickitat River for anadromous fish.

Recreation:

Sports fishing is the most popular recreational use of the basin's waters and the area is visited by many fishermen from more populous regions. In season, hunting also attracts many outsiders who camp along the streams.

Pollution Contributed to Water Resources

Basic data on sources of municipal and industrial pollution are included in Tables K and L, pages 97 to 101. There are two municipal and two industrial sources of pollution in the basin. The effluent from the Goldendale municipal treatment plant is discharged into Klickitat River.

The Goldendale Meat Co., Goldendale, discharges inadequately treated plant wastes into Klickitat Creek. The Klickitat Pine Box Co., also of Goldendale, and a number of residences in an unsewered area of that community also discharge inadequately treated sanitary sewage into a drainage ditch leading to Klickitat Creek.

Damages to Water Resources from Pollution

Discharge of inadequately treated industrial wastes and sewage from an unsewered area at Goldendale creates a potential health hazard and nuisance conditions in Klickitat Creek and a drainage ditch connected to it. These conditions are especially severe during the warm summer months.

Pollution Prevention Measures in Effect

Goldendale has a treatment plant which provides an intermediate degree of treatment and is considered satisfactory at the present time. Because of infiltration and storm water connections, the load on this plant has about reached capacity. Further expansion of the sewerage system will require something be done about reducing the present load on the plant or increasing its capacity. Klickitat has a primary treatment plant which is also considered to be satisfactory.

The Goldendale Meat Co. treats its wastes in a septic tank but lacks recovery facilities. The Klickitat Pine Box Co. has a septic tank which discharges the inadequately treated effluent into a roadside drainage ditch.

Pollution Prevention Measures Required

The program for water pollution control in this basin consists of the operation of existing municipal treatment plants in a satisfactory manner and the following extensions or improvements to existing facilities:

MUNICIPALITIES

GOLDENDALE (Pop. 1,907) -- The sewerage system should be extended to cover an unsewered area from which septic tank wastes are discharged into a drainage ditch leading to Klickitat Creek and additional capacity should be provided in the treatment plant either by eliminating infiltration and storm water separation or by enlargements.

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum requirements for industrial waste prevention adopted by the Washington Pollution Control Commission whether or not the plant is connected to a municipal sewerage system.

KLICKITAT PINE BOX CO., (Goldendale (Pop. equivalent of sanitary wastes 50) -- A connection should be made to the Goldendale sewers when they are extended in order that sanitary wastes can be adequately treated.

GOLDENDALE MEAT CO., Goldendale (Pop. equivalent of wastes 2,700) -- Facilities for collection of blood, paunch manure and grease should be provided in order to secure more adequate waste treatment.

HOOD RIVER

The Hood River has its source in the glaciers on the east and north slopes of Mt. Hood in Oregon. The East Fork, the principal tributary, rises at an elevation of about 7,500 feet, above mean sea level, and flows for a distance of 25 miles to the junction with Middle Fork where the main river is formed. West Fork enters the main stem about two miles below this junction. About 12 miles below this point, the Hood River enters the Columbia River at Hood River, Oregon.

The basin has a drainage area of 335 square miles from which the average annual flow is about 1,000 cubic feet per second. The minimum recorded daily flow from 329 square miles of the area was 165 cubic feet per second.

Present and Future Uses of Water Resources

Municipal Water Supply:

The city of Hood River obtains its water supply from Cold Springs and supplies 4,000 persons. The Cascade Locks municipal system serves a population of 750 with water taken from Dry Creek, a tributary of the Hood River.

Industrial Water Supply:

There are four industrial water supplies located in the basin. The Oregon Lumber Co. of Dee obtains its supply from the Cold Springs pipe line of the city of Hood River and filters about 250,000 gallons daily for use in the company's hardboard plant. The Apple Growers' Association of Hood River obtains its supply from Odell Creek and a spring. Duckwall Bros., Inc., of Hood River, obtains water from Paradise and Coe creeks. The Hood River Box and Veneer Co. has a spring supply.

Agricultural Water Supply:

About 25,100 acres of land are presently irrigated from natural flows of the Hood River and its tributaries. Some of these lands need more water, which can be provided by storage facilities.

Proposed developments include storage on Neal Creek to provide supplemental water for about 11,000 acres of land.

Fish and Wildlife:

Hood River formerly supported good runs of fall chinook salmon, silver salmon and steelhead trout, and continues to maintain a fair run of steelhead. The chinook run is now very small. Extensive diversion of water for power and irrigation causes extremely low flow in stretches of the river during the period of the fall runs. The upper sections of the streams are of some sports-fishery value for resident trout. Game animals are plentiful throughout the basin.

Under the Lower Columbia River Fishery Development Program, first preference has been given to development of the river for salmon. This would involve removal of natural falls, construction of hatcheries and improvement of the stream for spawning and rearing salmonoid fish.

Recreation:

Hunting and fishing are the principal recreational attractions along the streams of the basin. A number of lakes afford both boating and fishing. The Forest Service has constructed overnight camping facilities in the National Forest and a number of summer homes have been built on Lost Lake.

Pollution Contributed to Water Resources

The Oregon Lumber Co., Hardboard Division plant, at Dee is the principal source of pollution in the basin. Wastes from this plant, discharged to the East Fork of Hood River about two miles upstream from its junction with the West Fork, have a population equivalent of about 64,000.

Damages to Water Resources from Pollution

Because of the short time of flow from Dee to the Columbia River and the good reaeration characteristics of the stream, dissolved oxygen conditions in the waters of Hood River do not appear to be a problem. Principal damages are coating of the stream bed by fiber wastes, the occurrence of fungus growths, and discoloration of the water. An average of about six tons of fiber are lost in the river during a 24-hour period of operation of the hardboard plant.

Pollution Prevention Measures Required

The water pollution control program for the basin is as follows:

OREGON LUMBER CO., HARDBOARD DIVISION, Dee, Oregon (Pop. equivalent of wastes 100,000) -- Facilities of a type which will remove fibers and other suspended matter from the plant's wastes should be provided. Suspended solids in the plant's wastes, which at times reach 14.6 percent by weight of the total hardboard production, should be reduced to at least one percent.

SAW MILLS -- In accordance with Oregon State law, all saw mills should provide facilities to prevent sawdust, bark, and other debris from entering the water.

WHITE SALMON RIVER

White Salmon River has its source on the southern slope of Mount Adams in the State of Washington, and flows south about 38 miles to the Columbia River at Underwood, Washington. The basin's drainage area is about 384 square miles. The average annual flow is estimated at 1,020 cubic feet per second.

Present and future Uses of Water Resources

Municipal Water Supply:

White Salmon, Washington, obtains its domestic water supply, which serves 1,400 persons, from a tributary of the White Salmon River. Two other communities located in the basin, Bingen and Trout Lake, with populations of 750 and 300 respectively, use ground water supplies. Bingen has a connection to the White Salmon system for an auxiliary supply.

Agricultural Water Supply:

Part of the natural flow of White Salmon River is diverted for irrigation of 5,500 acres of land. Additional agricultural use of the water resources is for watering livestock.

Fish and Wildlife:

A power dam located near the mouth of White Salmon River blocks the spawning areas for anadromous fish in this stream. However, a fish hatchery located near the mouth of the river below the dam recently has increased the runs of chinook salmon into the lower river. Trout, bass, and other resident fish occupy the streams and lakes above the dam.

Many species of big game, upland game birds, and fur-bearing animals inhabit the area.

Recreation:

Fishing and hunting are the principal recreational activities of the basin.

Pollution Contributed to Water Resources

The Glacier Orchards Fruit Packing plant at Husum and the White Salmon Dressed Meats plant near White Salmon are the only sources of pollution in the basin. No significant pollution problems exist at the present time.

Pollution Prevention Measures Required

The restriction of recreational use and the control of logging operations above the White Salmon water supply watershed is the only requirement for control of pollution in this basin at the present time.

SANDY RIVER

The Sandy River drains an area of 510 square miles of the south and west slopes of Mount Hood. It enters the Columbia River about 20 miles upstream from Portland. A greater portion of the basin area is heavily forested. Public water supply and power requirements utilize most of the summer and low water flows in the river.

Present and Future Uses of Water Resources

Municipal Water Supply:

About one third of the population of Oregon is supplied with water obtained from the Sandy River basin. The forest-covered watersheds draining the south and west slopes of Mount Hood provide an excellent quality of water for domestic use. The water supply of the City of Portland is obtained from a 102 square mile uninhabited forest area of Bull Run River and serves a population of 478,000. Five smaller communities and water companies supplying 3,550 people use surface supplies. A population of 1,150 living in two communities have spring and well supplies.

Chlorination is the only treatment necessary for the surface supplies at the present time.

Industrial Water Supply:

The Bissinger and Co. textile mill of Troutdale is the only industry which has its own water supply. The source for this supply is a spring.

Agricultural Water Supply:

Irrigation is unimportant in this basin. A usually plentiful, early season rainfall and a lack of suitable irrigable lands are two of the factors limiting the use of the water resources for irrigation. As there is very little open land available for grazing, little use is made of the water for livestock watering purposes.

Fish and Wildlife:

Sandy River supports runs of fall chinook salmon, silver salmon, shad, spring chinook and steelhead trout. The river also supports a large and valuable run of smelt. The upper section of the main river and most of the tributaries have a high value for resident trout, being one of the most heavily fished areas in the State.

Salmon runs are presently being augmented by an Oregon State Fish Commission hatchery on Cedar Creek, a tributary of the Sandy. Because of a power diversion at Marmot, the upper section of the river containing large amounts of good spawning areas is not accessible to anadromous fish during the low water periods.

Principal species of big game inhabiting the area are bear and black and white-tailed deer.

Recreation:

That portion of the basin comprising the water supply watershed for the City of Portland is closed to all forms of recreation. Hunting and fishing are popular in other parts of the basin. During the annual smelt run, thousands of people flock to the lower river with dip nets to obtain their limit of these fish. The lower Sandy River is also used extensively by swimmers during the summer months.

Probably the most popular recreational activity of the basin is the winter sports on Mount Hood. Government Camp and Timberline Lodge and their excellent facilities for skiing attract thousands of people each weekend to these resorts. Many cabins, summer homes, and camps located on the slopes of Mount Hood are used during the summer months.

Pollution Contributed to Water Resources

The principal sources of pollution in the basin are the sewage from the Government Camp recreational area and the Bissinger & Co. textile mill at Troutdale. The Government Camp area is at the headwaters of creeks used further downstream for public water supply. Although the community is unsewered, domestic pollution enters these creeks by way of drainage from septic tanks and outdoor privies. There are a number of residences several club house stores and hotels located in the Government Camp area.

The Bissinger & Co. plant discharges untreated wastes into the Sandy River about two miles above the Columbia River.

Damages to Water Resources from Pollution

Streams draining from the Government Camp area are used extensively for drinking purposes and recreation. The pollution from the residences and commercial establishments in the area is endangering the use of waters and depreciating the value of summer homes and other property located downstream.

Pollution Prevention Measures Required

Waters of the Sandy River Basin are of exceptionally good quality where they have not been affected by pollution. In order to preserve this excellent quality, definite steps must be taken to eliminate existing pollution and to provide more sanitary means for disposal of wastes from the thousands of visitors who are attracted to Mount Hood. The existing facilities for housing overnight visitors and for camping and picnicking are scattered, which makes it difficult and costly to install adequate sewers and treatment facilities. Because of melting snow, which occurs during the entire summer, the ground water table is high, making the use of septic tanks unsatisfactory. The present program for prevention of pollution is as follows:

GOVERNMENT CAMP -- A sewerage system and a treatment plant of a type which will provide the equivalent of secondary treatment with disinfection of the effluent should be constructed.

BISSINGER & CO., Troutdale -- A treatment plant or other suitable disposal facilities should be provided.

COLUMBIA SLOUGH

Columbia Slough is a narrow back channel which is roughly parallel with Columbia River. From a controlled inlet ditch on the upper end, it skirts the north limits of Portland and joins the Willamette River about one-half mile above the confluence of that river and the Columbia River. The upper portion of the slough is used primarily as a drainage ditch while along the portion adjacent to Portland there are located many large industries which use the waterway for transportation purposes. Before joining the Willamette River the slough flows through a number of lakes which provide excellent waterfowl hunting.

The flow in the slough is low during most of the year, because it is affected primarily by backwater from the Columbia and Willamette rivers. For this reason many of the pools are stagnant and unattractive.

Present and Future Uses of Water Resources

Industrial Water Supply:

Eleven industries located along Columbia Slough have private wells which are used for supplying cooling water. Water for drinking and processing purposes is obtained from the Portland city supply.

Navigation:

Channel widths and depths and bridge clearances limit navigation to the towing of logs to lumber and shingle mills in the industrialized area.

Proposed improvements would provide a channel of adequate width and depth and sufficient clearance at bridges for barge transportation.

Fish and Wildlife:

High temperature, low dissolved oxygen concentrations, and generally gross pollution in the stretch below Portland make the slough unfit for most species of game fish. Carp and other rough fish are found in most sections, but these are rarely fished.

The lakes and bottom lands in the lower stretch of the slough are attractive to ducks and geese which use these waters for resting during migration and for nesting purposes.

Recreation:

In the lower sections where it is permitted, extensive use is made of the lakes and the Slough for hunting waterfowl.

Proposed channel improvements would provide more extensive use of the stream for picnicking and pleasure boating.

Pollution Contributed to Water Resources

The principal sources of pollution along Columbia Slough are the wastes discharged by 23 industrial plants. These include eleven meat packing, slaughtering or rendering plants, five hog feeding farms, one dairy products plant, two metal products plants, one textile mill, one chemical plant, one petroleum plant and one canning and preserving plant. The organic wastes discharged from 14 of these plants have a population equivalent of about 69,200. Basic data on sources of pollution are shown in Table L, pages 97 to 101.

Damages to Water Resources from Pollution

Many complaints have been made by downstream water users regarding the pollution in Columbia Slough. Principal complaints have come from shingle and lumber mill operators who are required to handle logs in the water. These logs become slimy and slick, making it very unsafe for men to walk on them. Since the industries also dispose of their sanitary sewage into the slough, these lumber workers are subjected to a potential health hazard in handling logs.

During the warm summer months nuisance conditions exist in many parts of the slough and impounded areas along the bank.

Pollution Prevention Measures in Effect

Five industries located on the Columbia Slough have waste treatment or other satisfactory disposal measures. These five, all of which provide a satisfactory degree of treatment, are as follows:

<u>Name of Industry</u>	<u>Type of Waste</u>	<u>Method of Treatment or Disposal</u>
Alderwood Dairy	Organic	Septic tank and subsurface tile field
Montag Stove Works	Sanitary	Septic tank and subsurface tile field
Pacific Carbide & Alloys	Inorganic	Lagooning with seepage to soil
Leatherman Oil Co.	Inorganic	Lagooning with seepage to soil
Templeman Slaughterhouse	Organic	Septic tank--effluent to stream

Pollution Prevention Measures Required

The Oregon State Sanitary Authority has instructed the industries located on Columbia Slough that pollution of these waters must be stopped when the Portland sewage treatment is placed in operation. These establishments have the alternative of connecting with the Portland system or constructing their own treatment plants.

The following industries are included in the group which have received orders from the Sanitary Authority:

Stearns and Welch Meat Co.	Armour and Co.
Portland Provision Co.	Kenton Packing Co.
Portland Rendering Co.	Pete Wess Hog Feeding Farm
Western States Rendering Co.	B & B Hog Feeding Ranch
Pacific Meat Co.	Clem Ponta Hog Feeding Farm
Gem Meat Co.	Tony Cervetto Hog Feeding Farm
Branders Meat Co.	J. & C. Cervetto Hog Feeding Farm
Associated Meat Packers	

The Columbia Pickle Company, which discharges organic wastes, and the Electrical Metallurgical Company which discharges inorganic wastes into the slough, need to provide new treatment plants or other suitable waste disposal facilities.

The Columbia Wool Scouring Company's textile mill must connect with the Portland city sewers.

Those plants which will connect with the system of the city of Portland will be required to collect blood, grease, manure, offal, and other waste solids prior to disposal of their liquid wastes into the city sewers. Those constructing their own treatment plants must provide a degree of treatment equivalent to that provided by secondary treatment.

MULTNOMAH CHANNEL

Multnomah Channel is a natural waterway which branches off from the Willamette River about three miles above its junction with the Columbia and flows northward to join the latter near St. Helens, Oregon. The land area between the channel and Columbia River is known as Sauvie Island. A considerable portion of the total flow of the Willamette River passes through Multnomah Channel.

Principal uses of the Channel are for industrial water supply, navigation and recreation.

Present and Future Uses of Water Resources

Industrial Water Supply:

The St. Helens Pulp and Paper Co. and Fir-Tex Insulating Board Co. obtain water for plant operations from the Channel. The pulp mill filters its water and the Fir-Tex Company provides sedimentation prior to use.

Navigation:

Smaller draft boats and barges use Multnomah Channel for transporting commodities.

Fish and Wildlife:

Most of the spring runs of chinook salmon which migrate up the Willamette River enter the latter through the Multnomah Channel. While fall runs have been reduced to residual fragments of the original numbers, and survived only by entering the stream late in the fall, there is a considerable run of fall chinook and silver salmon passing through this area. Commercial fishing for salmon is not allowed in this waterway. However, commercial crawfishing was of considerable importance until recent years.

The Lower Columbia River Fishery Development Program contemplates use of Multnomah Channel by fall runs of salmon migrating up the Willamette River.

Recreation:

Multnomah Channel is the most important sports fishing section of the basin during the spring runs of chinook salmon. A number of derbies are sponsored by business concerns of Portland, St. Helens, and other localities. The many moorages located along Multnomah Channel rent space and boats for a considerable portion of their annual income.

Pollution Contributed to Water Resources

The major sources of pollution in Multnomah Channel are the wastes discharged by the industries situated along it and waters from the Willamette River. During the summer and fall months when the Willamette River is heavily polluted, a considerable portion of its outflow to Columbia River is through Multnomah Channel and at this time the channel carries a heavy polluttional load. Data on wastes discharged by the three industries located on Multnomah Channel are as follows:

<u>Name of Industry</u>	<u>Location</u>	<u>Principal Wastes</u>	<u>Pollution to Watercourse (P.E.)</u>
Hunt Foods, Inc.	Scappoose	Cannery	0
St. Helens Pulp & Paper Co.	St. Helens	Wood Pulp	100,000
Fir-Tex Insulating Board Co.	St. Helens		<u>110,000</u>
TOTAL			210,000

The Hunt Foods Co. cannery located at Scappoose lagoons its wastes, none of which presently reach the Channel. The St. Helens Pulp & Paper Co. mill produces mechanical pulp from which it makes paper. Wastes from the production of pulp and from glue used in manufacturing paperboard are discharged by the Fir-Tex Co.

Damages to Water Resources from Pollution

Crawfish, which were at one time of considerable commercial value, have been practically exterminated in Multnomah Channel. This has been attributed to the heavy pollution load carried by the water during the late summer and early fall months. A zone of zero dissolved oxygen content was found in the Channel about 9 miles below the Willamette River during the most recent survey conducted by the Oregon State Sanitary Authority in September 1951. Further downstream, just above the waste outlet of the Fir-Tex Insulating Board Company plant, about four parts per million of dissolved oxygen were found in the water. Near the mouth of the Channel, about two miles below the waste outlet of the St. Helens Pulp and Paper Company plant, less than one part per million of dissolved oxygen was found.

Excessive bacterial contamination was also found to exist in the Channel during the 1951 surveys.

Pollution Prevention Measures Required

The removal of municipal and industrial wastes of the city of Portland from the Willamette River and pollution abatement in the Willamette River Basin above Portland will greatly improve the quality of water entering Multnomah Channel. This program is well underway. The program for Multnomah Channel is as follows:

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum standards of purity and general requirements for disposal of sewage and industrial wastes as adopted by the Oregon State Sanitary Authority.

FIR-TEX INSULATING BOARD CO., St. Helens (Pop. equivalent of wastes 70,000) -- Facilities for more efficient recovery of wood fibers and either a waste diffusion outlet into the main channel of the Columbia River or other suitable disposal facilities should be provided.

ST. HELENS PULP AND PAPER CO., St. Helens (Pop. equivalent of wastes 150,000) -- A waste diffusion outlet into the main channel of the Columbia River or other suitable disposal and recovery facilities should be provided.

LAKE RIVER--SALMON CREEK

Lake River and tributaries drain an area of 155 square miles to the north and west of Vancouver, Washington. The main waterway river has its source in Vancouver Lake and parallels Columbia River for 12 miles before emptying into that river. Salmon Creek, the principal tributary, originates on Elkhorn Mountain directly north of Camas, Washington,

Present and Future Uses of Water Resources

Municipal Water Supply:

The community of Battleground, Washington, obtains water for domestic use from Clark County Dairymen's Cooperative well supply.

Industrial Water Supply:

The Clark County Dairymen's Cooperative obtains water for processing purposes from wells. This industry also supplies water for use by residents of the town of Battleground.

Agricultural Water Supply:

The principal agricultural use of the basin's water resources is watering livestock. About one-third of the land area lies below elevation 300 and makes excellent pasture for dairy herds.

Although no projects are presently contemplated, a considerable portion of this lowland area could be irrigated.

Fish and Wildlife:

Some spring chinook, silver salmon and steelhead trout enter the basin; however, beaver dams and other obstructions form partial barriers to fish during low water periods. Development of the stream as a salmon spawning area appears to be the best use at the present time.

The upper tributaries support resident trout. Because it occasionally is flooded from Columbia River, Lake Vancouver is not an important sports fishing lake. It is, however, an important nesting area for migratory waterfowl.

Recreation:

Boating on Lake Vancouver and hunting and fishing are the principal recreational activities of the area.

Pollution Contributed to Water Resources

Basic data on sources of pollution are included in Table L, pages 99 to 101. The principal sources of pollution in this basin are the industrial wastes from three poultry processing plants and one dairy plant. The Clark County Dairymen's Coop. at Battleground discharges wastes having a population equivalent of 2,000 to Salmon Creek. Also the Cliff Holmes poultry processing plant at Battleground discharges an unknown quantity of wastes to the same stream. The Voss Fryers poultry plant at Battleground and the H. S. Fenton poultry plant at Orchards provide adequate treatment of their wastes before discharge to land.

Damages to Water Resources from Pollution

During the summer months when stream flows are low, milk and poultry processing plant wastes and overflow from the individual septic tanks cause nuisance conditions at Battleground and serious pollution in salmon Creek. Improvement in the quality of water in Salmon Creek is necessary in order to achieve full value from its proposed use for salmon propagation.

Pollution Prevention Measures Required

The program for prevention of water pollution in this basin is as follows:

MUNICIPALITIES

BATTELGROUND (Pop. 750) -- Sewers and a treatment plant which will provide the equivalent of secondary treatment with disinfection of the effluent should be constructed.

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum requirements for industrial waste prevention adopted by the Washington Pollution Control Commission whether or not the plant is connected to a municipal sewerage system.

CLARK CO. DAIRYMEN'S COOP., Battleground (Pop. equivalent of wastes 2,000) -- The State Department of Agriculture has ordered this dairy to build a complete new plant. Modern waste prevention methods and waste disposal facilities providing the equivalent of secondary treatment should be incorporated into this new plant. The possibility of connection to the planned sewerage system of Battleground should be investigated.

CLIFF HOLMES, Battleground. A treatment plant which will provide the equivalent of primary treatment should be provided.

LEWIS RIVER

The Lewis River Basin occupies an area of 1,050 square miles in Washington, lying between the Cowlitz River Basin to the north and the Lake River--Salmon Creek Basin to the south. The main branch has its source on the northwest slope of Mount Adams. It flows in a southwesterly direction about 110 miles and joins the Columbia River about 19 miles below Vancouver, Washington.

The entire basin originally was covered with timber, but logging and fires in the lower section have created open land now cleared for agricultural use. A major portion of the basin area, however, still remains in virgin forests.

Flows are similar to those of most streams west of the Cascades, being greatest during the winter and spring and lowest during the summer months. The average annual flow to the Lewis River is estimated at 5,900 cubic feet per second. The minimum flow is estimated to be about 770 cubic feet per second.

Present and Future Uses of Water Resources

Municipal Water Supply:

Water from the Lewis River is used to supply the domestic needs of 1,200 people in Woodland. Yacolt obtains its supply for 400 people from Big Creek. Chlorination is the only treatment necessary for these waters at the present time.

The community of LaCenter supplies a population 200 with water obtained from wells.

Agricultural Water Supply:

Irrigation is not an important use of the basin's water resources at the present time. A considerable acreage along the East Fork and in the Salmon Creek basin to the south could be irrigated from developments on the East Fork of Lewis River.

Streams of the basin are used for watering livestock.

Fish and Wildlife:

A power dam on Lewis River about 20 miles above its mouth renders a large portion of the basin's streams inaccessible to anadromous fish. However, the Lewis River supports a good run of smelt. Two fish hatcheries have been constructed below the dam to offset the loss of upstream

spawning areas. Cedar Creek and the East Fork tributaries which enter below the dam provide spawning areas for silver and chinook salmon and support steelhead and cutthroat trout. The Washington Department of Fisheries as a participant in the Lower Columbia River Fishery Development Program has greatly increased the value of Cedar Creek to anadromous fish in recent years by stream-improvement work. The main river and practically all of the tributaries support good populations of resident rainbow and cutthroat trout. Many species of wildlife inhabit the timbered mountainous areas.

Navigation:

The lower section of Lewis River is affected by tidal action and is navigable as far upstream as Woodland.

Recreation:

The Lewis River Basin is very popular for sports fishing and hunting. Boating, camping, and picnicking are also popular.

On the north fork of the Lewis River above the Merwin Dam, the Yale Dam is now being constructed by the Pacific Power and Light Company. Future use of the waters of the Yale impoundment will be impaired by inadequate clearing of the area, as it is planned to remove timber from that area between high and low water and to leave the remainder standing. This will be particularly harmful to troll fishermen and the brush and litter from the uncleared area will create unsightly conditions on the surface of the lake. Many local sports groups and the Washington Department of Game have entered complaints. Although present foreseeable benefits may not justify the expenditure of additional funds for clearing the entire lake bed, it is a common practice in the Pacific Northwest to clear areas to be flooded by impoundments. If such a clearing practice as proposed by the power company becomes widespread, it will probably result in severe curtailment of recreation on many of the Pacific Northwest impoundments.

Pollution Contributed to Water Resources:

There are five sources of pollution in this basin. The Woodland municipal system, serving a population of 800, has a primary treatment plant which is of adequate capacity and is operated satisfactorily. The Lewis River Meat Company, of Woodland, recovers most of its wastes and has a septic tank. The effluent from the septic tank is disposed of on land. The Woodland Valley Packing Company, Weedman Lumber Company, and Wyman Lumber Mill dispose of inadequately treated wastes to Horseshoe Lake near Woodland.

Damages to Water Resources from Pollution

The principal polluttional damages at the present time are to the waters of Horseshoe Lake where sawdust, bark, meat packing plant wastes, and other debris are allowed to enter the waters. These wastes are deleteriously affecting the fishing and recreational use of these waters. The seepage from septic tanks in the vicinity of Yacolt is also damaging the water resources in this area.

Pollution Prevention Measures Required

The program for prevention of pollution in this basin is as follows:

MUNICIPALITIES

YACOLT (Population 411) -- A sewerage system and a sewage treatment plant of a type which will provide the equivalent of primary treatment with effluent disinfection should be provided.

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum requirements for industrial waste prevention adopted by the Washington Pollution Control Commission whether or not the plant is connected to a municipal sewerage system.

WOODLAND VALLEY PACKING CO., Woodland (Pop. equivalent of wastes 230) -- In order to use effectively the existing septic tank at this plant, blood and grease should be collected continuously. A submerged outlet into the lake should be provided for the septic tank effluent.

WEEDMAN LUMBER CO., Woodland -- This company should provide sufficient care in its operations to prevent sawdust, bark, and other debris from entering Horseshoe Lake.

WYMAN LUMBER MILL, Woodland -- Facilities which will prevent sawdust, bark and other debris from entering Horseshoe Lake should be provided.

COWLITZ RIVER

The Cowlitz River drains the western slopes of the Cascade Range from Mount Rainier south to Mount Adams and Mount St. Helens, all in southwestern Washington. The basin has a drainage area of 2,490 square miles. The watershed originally was heavily timbered, but large areas of bottom lands have been cleared and are now under cultivation. At higher elevations, however, there are large areas of second growth and virgin timber.

Run-off results primarily from rainfall and is characterized by high flows between November and June and low flows from July through October. Snow-melt from the headwaters area contributes appreciably to the late spring and summer flows. The estimated average annual flow of the Cowlitz River is 9,600 cubic feet per second.

Present and Future Uses of Water Resources

Municipal Water Supply:

At present, a population of 32,800, living in five communities, depends upon surface supplies as principal sources for domestic use. Longview and Kelso use water from the main stem of the Cowlitz River after treatment by filtration and chlorination. Tributaries and smaller creeks are used by Morton, Vader, and Ryderwood. Vader, also, has a supplemental well supply. Chlorination is the only treatment necessary for the tributary supplies at the present time.

The four communities of Castle Rock, Winlock, Randle, and Toledo, which have a combined population of 3,150, use ground water supplies.

Industrial Water Supplies:

At present two industries use surface waters as their principal source of supply. The Longview Fiber Co. of Longview, uses Cowlitz River water and the Mayfield Canning Co. of Mayfield uses water obtained from a creek for processing. The latter plant obtains drinking water from springs. The Dell Dairy at Winlock has a well supply.

Other than the supply at Longview Fiber Co., which receives treatment with chloramine, none of these supplies requires treatment at the present time.

Agricultural Water Supply:

Irrigation in the basin is practised to a very minor extent. In the lower valleys dairy herds are watered from surface sources.

Proposed irrigation developments of the Bureau of Reclamation include the Jackson Prairie Project which would provide Tilton River water for about 30,000 acres of land.

Fish and Wildlife:

The Cowlitz River is the most valuable lower Columbia River tributary from the standpoint of present and potential fishery resources. Most of its stream system is unaffected by agricultural, industrial, or other water-use developments. There are at present large runs of salmon, steelhead, and sea-run cutthroat trout throughout the main stem and most tributaries, and the lower main river maintains a valuable run of smelt, for which there is an intensive commercial and sports fishery.

A wide variety of resident fishes in the Cowlitz system contribute to a sports fishery of great recreational value. Rainbow, cutthroat and eastern brook trout are taken from most of the lakes and streams. Silver Lake is the most famous bass-fishing lake in the State of Washington.

The Cowlitz River is one of the most important streams in the Lower Columbia River Fishery Development Program. Two fish hatcheries are now under construction in the basin.

Waterfowl, deer, elk, and bear are the principal wildlife species of the basin. Because much of the forest area is uninhabited and difficult to hunt, there are large numbers of big game.

Recreation:

Spirit Lake, at the head of Toutle River, is the center of a popular recreational fishing area. Fishing in the lakes and streams is probably the most popular recreational activity. Many people from the populous centers around Puget Sound fish and hunt in the area. Boating on the lakes and in the lower river, where smelt fishing is also popular, are other activities enjoyed by many people. There is some swimming in the lower stretches of the main river and on Toutle River.

Navigation:

There is considerable barge transportation in the lower stretch of the main river above Longview, Washington.

Pollution Contributed to Water Resources

Inadequately treated sewage is discharged by Winlock and raw sewage by Vader, Toledo and Castle Rock. The first community has a septic tank which is being bypassed at the present time. The communities of Morton, Ryderwood, and Kelso have installed adequate treatment facilities during recent years.

The Pacific Paper Board Company plant at Longview was, until it burned down recently, the principal source of pollution in the lower river area. The Lewis County Gravel operations at Harmony, Toledo, and below Toledo, and the Central Smelt Company of Kelso are the principal industrial polluters at the present time. Minor amount of industrial wastes are discharged by the Mayfield Cannery, Mayfield; S & M Dairy, Toledo; and Dell Dairy, Winlock. The Morton Packing Company, Morton, the Perma Products Corp., Winlock and the Longview Meat Packing Company, Longview, have adequate waste treatment facilities.

Damages to Water Resources from Pollution

Most population and industrial development of the basin is located near the mouth of the Cowlitz River, where the major pollutional damages have occurred. Prior to being destroyed by fire, the Pacific Paper Board Company discharged about 2 million gallons of water containing as high as 8 tons of fiber during a day's operation. This resulted in extensive sludge bank formations near the mouth of the river. It has also been claimed that polluted backwater from the Columbia River, under certain tidal and wind conditions, could possibly cause additional pollution in the lower Cowlitz River. Lack of significant smelt runs in the Cowlitz River during recent years may have been caused by this pollution. Reduction in pollution in the river as a result of the recent construction of waste treatment facilities and the burning of the Pacific Paper Board Company plant preceded the large smelt run of 1952.

Raw and inadequately treated sewage discharged by upstream communities have, for a number of years, been the principal sources of bacterial contamination which affect municipal and industrial water supplies obtained from the Cowlitz River.

Pollution Prevention Measures Required

Because of its present and potential value in connection with the fishery resources of the Columbia River and its water supply and recreational uses, a program for water pollution control in the Cowlitz River Basin is necessary. This program is as follows:

MUNICIPALITIES

MORTON (Pop. 1,140) -- Improved operation of existing secondary waste treatment plant.

WINLOCK (Pop. 880) -- The existing septic tank should be replaced with a modern plant of a type which will provide the equivalent of secondary treatment with disinfection of the effluent.

VADER (Pop. 430) -- The sewerage system should be extended and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

CASTLE ROCK (Pop. 1,250) -- The sewerage system should be extended and a treatment plant of a type which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

TOLEDO (Pop. 550) -- The sewerage system should be extended and a treatment plant which will provide the equivalent of primary treatment with disinfection of the effluent should be constructed.

INDUSTRIES

All industries should provide the necessary facilities to comply with the minimum requirements for industrial waste prevention adopted by the Washington Pollution Control Commission whether or not the plant is connected to a municipal sewerage system.

LEWIS COUNTY GRAVEL OPERATIONS, Harmony -- Settling ponds should be provided for disposal of gravel washings.

LEWIS COUNTY GRAVEL OPERATIONS, Toledo -- Dredging operations should be moved to a location in the Cowlitz River where less disturbance of the river bed would be created.

LEWIS COUNTY GRAVEL OPERATIONS, (below Toledo) -- Settling ponds should be provided for disposal of gravel washings.

CENTRAL SMELT CO., Kelso -- Screening facilities should be provided on all wash water drains.

PACIFIC PAPER BOARD CO., Longview -- This plant was destroyed by fire in January, 1952. When it is rebuilt, effective provisions for fiber recovery should be made.

MAYFIELD CANNERY, Mayfield, S & M Dairy, Toledo, and DELL DAIRY, Winlock -- Pollution problems at these plants are of a minor nature at the present time.

MINOR TRIBUTARIES

The principal uses of the streams tributary to the Columbia River in this basin are for municipal and industrial water supply, fish and wildlife, and recreation. East of the Cascades about 25,000 acres of land are irrigated from minor tributary streams.

Fifteen communities in Oregon, which supply the domestic needs of 30,125 people, obtain water from minor tributary streams. In Washington, four communities supplying the needs of 3,500 people also obtain water from minor tributaries.

Chlorination is the only treatment required for all except two of the surface supplies at the present time. The water supply of The Dalles, Oregon, obtained from Mill Creek and Dog River, and the Ilwaco, Washington, supply from Black Lake are filtered and chlorinated.

Six industries located in Oregon obtain their water supplies from minor tributary streams. Detailed data on municipal and industrial water supplies are shown in Tables 19 and 20 of the Appendix.

There are no sources of municipal or industrial pollution located above the water supply intakes of these minor tributary streams. Some water supplies have been damaged, however, from improperly constructed forest access roads, forest fires, and improper logging operations on the watersheds. The restriction of the recreational use and the control of logging operations above both municipal and industrial water supply intakes are essential for preservation of these waters in their present state.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

Measures which prevent water pollution and the construction of municipal and industrial waste treatment plants have resulted in benefits of great importance to the water resources of this basin. A number of the municipalities and industries, depending upon tributary streams for their water supplies, have been able to continue using these sources without the necessity of providing costly water treatment facilities, only because logging operations in their watersheds have been carefully planned and carried out.

In that portion of the Walla Walla River Basin located in Oregon, construction of treatment facilities and pipe lines has made possible the use of municipal and industrial wastes for irrigation of large acreages of farm lands and protected the valuable water resources. In the Deschutes River Basin treatment and/or disposal of municipal and industrial wastes into underground caverns have helped preserve the excellent quality of waters diverted through canals to irrigate lands, provide water for livestock, and in many areas water to fill cisterns and municipal reservoirs for domestic use. Although the Oregon State Board of Health does not recommend use of such waters for domestic purposes without being properly disinfected, many rural people have been drinking the untreated water.

Dispersion of pulp mill wastes into the main channel of the Columbia River at the mouth of the Cowlitz River and the reduction of pollutional wastes discharged to the latter river at Longview, Washington, appear to have increased, tremendously, the smelt runs in this river. With the diffusion at all concentrated sulfite mill wastes as an accomplished fact, it is anticipated that the Sphaerotilus growths in the main stem, Columbia River will be reduced to a point where they will no longer damage the commercial fishing industry during the next fishing season.

In a number of other tributaries the construction of municipal and industrial waste treatment facilities has corrected local nuisance conditions and has prevented serious damage to the water resources.

The abatement and prevention of pollution in the Lower Columbia River Basin will benefit all water users. The greatest benefits will probably accrue to water supplies, fish and wildlife, and recreation; but agriculture, navigation, power, and other uses will also derive benefits to a lesser degree.

Among important specific benefits resulting from the abatement of pollution are: a reduction in the cost of water treatment with an added measure of public health protection, and an improved quality of water; the provision of additional spawning and breeding areas and an improved environment for fish and wildlife; improved fishing conditions with greater returns to commercial fishermen and an increase in the sports

fishery throughout the basin; and appreciable financial returns from increased use of the basin by tourists and local residents for general recreation and from the development of additional recreational facilities at locations which are now unsuitable.

Adequate treatment of wastes now reaching waters used for irrigation will protect the quality of food produced on these lands. Where pollution has interfered with irrigation, abatement or control will enable additional irrigation projects to be developed. The removal of improperly treated sanitary wastes from areas where logging is carried on will protect the health of loggers and those engaged in the various lumber industries. Pollution abatement will result in protection to boats and their occupants using the waters for transportation, fishing, and pleasure. The elimination of Sphaerotilus will reduce the cost of fishing operations in areas where it now occurs. The clogging of gates and screens of dams as the result of improper disposal of wastes will be corrected, resulting in improved operating conditions at lower cost.

While it is difficult to assess in monetary terms all the tangible benefits which would be the result of an adequate pollution control program, there is no question but that they would far outweigh the costs of administering such a program including the costs of the necessary abatement works. In addition to the tangible benefits, the pleasure derived by those who use the river, either for business or recreation, and the improvement to the aesthetic qualities of now polluted areas are an added benefit which will increase to the happiness and welfare of all those who now or will in the future use the basin's waters.

TABLE K
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
COLUMBIA RIVER BASIN BELOW YAKIMA RIVER

NAME AND LOCATION	MILES ABOVE MOUTH	SEWERED POPULATION	UNTREATED WASTE *** (P. E.)	TREAT- MENT FACILITIES PROVI- DED	ADEQUACY OF TREATMENT FACILITIES		POLLUTION TO WATER- COURSE (P. E.)	TREAT- MENT NEEDS ****	PROJECT STATUS
					CAP'Y.	OPR.			
OREGON									
Columbia River - Main Stem									
McMurry	292	3,000	3,750	Primary	Sat.	Sat.	2,600	None	-----
Umatilla	289	500	500	Primary	Sat.	Sat.	350	None	-----
Arlington	243	600	600	None	---	---	600	NP	Inactive
Wasco	209-8	300	300	Secondary	Sat.	Sat.	0	NP	-----
The Dalles	189	7,500	10,000	None	---	---	10,000	NP	Inactive
Hood River	169	3,500	3,500	None	---	---	3,500	NP	Inactive
Troutdale	121-1	Needs sewers and sewage treatment		Secondary	Sat.	Unsat.	200	NP	Inactive
Wood Village	120	1,200	1,200	Secondary	Sat.	Sat.	100	I	Inactive
Waltomah County Farm Home	120	600	600	Secondary	Sat.	Sat.		None	-----
Fairview	119	Needs sewers and sewage treatment		Primary	Sat.	Sat.	2,100	NP	Inactive
Portland Airport	110	3,000	3,000	Primary	Sat.	Sat.		None	-----
Portland	105	100,000	100,000/	Primary	Unsat.	Sat.	65,000	A	Inactive
St. Helens	86	4,500	4,500	None	---	---	4,500	NP	Active Planning
Rainier	67	1,000	1,000	None	---	---	1,000	NP	Inactive
Clatskanie	49-2	750	750	None	---	---	750	NP	Inactive
Tongue Point Housing Project	18	300	300	Primary	Sat.	Sat.	0	None	-----
Tongue Point Naval Station	18	3,000	3,000	Primary	Sat.	Sat.	2,100	None	-----
Astoria	18	10,000	10,000	None	---	---	10,000	None	-----
Astoria - Riverwood Park	13	850	850	None	---	---	850	None	-----
Warrenton	7	1,500	1,500	None	---	---	1,500	None	-----
Walla Walla River									
	C313.9								
Hilton-Prosser	40	3,500	3,500	Secondary	Sat.	Sat.	0	None	-----
Umatilla River									
	C288.9								
Athens	42-35	750	750	Secondary	Sat.	Sat.	0	None	Under Const.
Pendleton	40	12,000	94,000	Secondary	Sat.	Sat.	33,000	None	-----
Airbase Housing	40	500	500	Secondary	Sat.	Sat.	50	None	-----
Stanfield	16	500	500	Secondary	Sat.	Sat.	100	None	-----
Orderville	12	1,200	1,200	Primary	Sat.	Sat.	0	None	-----
Harveston	7.5	3,500	3,500	Secondary	Sat.	Sat.	500	None	-----
Willow Creek									
	C252.5								
Hopewell	45	1,500	1,500	Secondary	Sat.	Sat.	300	None	Under Const.
John Day River									
	C217.9								
Prairie City	197	Needs sewers and sewage treatment						NP	Inactive
John Day	183	1,500	1,500	Secondary	Sat.	Sat.	300	None	-----
Canyon City	173-2	Needs sewers and sewage treatment						NP	Inactive
Fossil	92-16	500	500	Secondary	Sat.	Sat.	100	None	-----
Condon	52-14	900	900	Secondary	Sat.	Sat.	170	None	-----
Orocopia River									
	C203.6								
Oilechrist	198-28	500	500	Primary	Sat.	Sat.	0	None	-----
Hood	136	1,000	1,000	Primary	Unsat.	Unsat.	0	RI	Inactive
Hoodland	120	Needs sewer system and sewage treatment						NP	Inactive
Prineville	92-36	3,000	3,000	Secondary	Sat.	Sat.	1,500	None	-----
Hedra	103-7	Needs sewer system and sewage treatment						NP	Inactive
Warm Springs Indian Agency	77-1	400	400	Secondary	Sat.	Sat.	60	None	-----
Maple	38	250	250	Primary	Unsat.	Unsat.	0	RI	Inactive
Horo	20-2	300	300	Primary	Sat.	Sat.	0	None	-----
Sandy River									
	C121.2								
Government Camp	41-4-5	Needs sewers and sewage treatment						NP	Inactive
TOTAL IN BASIN									
		173,900	253,100				141,230		
Willamette River									
60 Municipalities (Inventory of Municipal and Industrial Waste Treatment Facilities - State of Oregon, 1953)									
		497,820	977,270				745,000		
OREGON TOTAL									
		671,720	1,230,370				886,230		

* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.

** River mileage expressed thus, 14-2, indicates a source of pollution 2 miles upstream on a tributary which enters main stream at river mile 14.

*** Includes industrial wastes discharged into municipal sewerage systems.

**** NP = New Plant; E = Enlargement; A = Addition; P = Replacement; None = No project required; C = Connect to city system; I = Improved operations.

1/ Includes only that part of total waste from City of Portland which is presently treated and discharged to Columbia River. The remainder (403,000) is now discharged to Willamette River.

TABLE K
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
COLUMBIA RIVER BASIN BELOW YAKIMA RIVER

NAME AND LOCATION	MILES ABOVE MOUTH	SEWERED POPULATION	UNTREATED WASTE *** (P. E.)	TREAT- MENT PROVI- DED	ADEQUACY OF TREATMENT FACILITIES		POLLUTION TO WATER- COURSE (P. E.)	TREAT- MENT NEEDS ***	PROJECT STATUS
					CAP'Y.	OPR.			
WASHINGTON									
Columbia River - Main Stem									
Kennecook	328	8,500	9,000	Primary	Sat.	Sat.	6,300	None	-----
Pasco	328	10,000	10,000	None	---	---	10,000	None	Under Construction
Big Pasco - Army Warehouse Area	324	Variable	Variable	None	---	---	Variable	C	Active Planning
North Valley	292	100	100	Minor	Sat.	Sat.	0	None	-----
Wishram	199	350	350	Minor	Unsat.	Unsat.	300	None	Inactive
Bingen	171	Needs sewers & sewage treatment.			---	---	---	None	Inactive
White Salmon	170	1,200	1,200	Primary	Sat.	Sat.	300	None	-----
Stovenson	151	500	500	None	---	---	500	None	Inactive
North Bonneville	145	Needs sewers & sewage treatment.			---	---	---	None	Inactive
Washougal	123	Needs sewers & sewage treatment.			---	---	---	None	Inactive
Camas	121	2,850	5,200	None	---	---	5,200	None	Active Planning
Vancouver (Treated)	109	22,500	38,500	Primary	Unsat.	Unsat.	27,000	I	Active Planning
Vancouver (Untreated)	105-107	7,000	7,000	None	---	---	7,000	C	Under Construction
Vancouver (Fourth Plain School)		400	100	Secondary	Sat.	Sat.	0	None	-----
Kelama	75	300	300	None	---	---	300	None	Inactive
Longview	67	13,800	17,000	None	---	---	17,000	None	Active Planning
Port of Longview (Longview)	66.5	Variable	Variable	None	---	---	Variable	C	Active Planning
Kathlamet	40	620	620	None	---	---	620	None	Inactive
Ilwaco	4	720	720	None	---	---	720	None	Inactive
Walla Walla River									
Walla Walla	35-5	24,000	24,000	Secondary	Unsat.	Unsat.	24,000	E	Active Planning
Walla Walla (Government Plant)	35-5	6,000	6,000	Secondary	Sat.	Sat.	600	None	-----
PSA Farm Labor Camp, Walla Walla	35-2	760	760	Secondary	Sat.	Sat.	150	None	-----
College Place	--	1,000	1,000	None	---	---	1,000	None	Under Construction
Walla Walla College (College Place)	35-2	1,100	1,100	Secondary	Unsat.	Unsat.	220	E or R	Inactive
Dayton	27-28	3,200	88,000	Secondary	Unsat.	Unsat.	58,500	E and I	Active Planning
Waitsburg	22-38	680	680	Secondary	Sat.	Sat.	100	None	-----
Klickitat River									
Goldendale	40	1,900	1,900	Secondary	Sat.	Sat.	475	None	-----
Klickitat	12	500	500	Primary	Sat.	Sat.	425	None	-----
Lake River - Salmon Creek									
Battleground	3-10	Needs sewers & sewage treatment.			---	---	---	None	Inactive
Ridgefield	3	200	200	None	---	---	200	None	Inactive
Lewis River									
Tacolt	25	Needs sewers & sewage treatment.			---	---	---	None	Inactive
Woodland	3	800	800	Primary	Sat.	Sat.	500	None	-----
Cowlitz River									
Morton	58-16	900	900	Secondary	Sat.	Unsat.	150	I	Active Planning
Winlock	26-9	620	620	Minor	Unsat.	Unsat.	600	R	Active Planning
Ryderwood	26-2-5	500	500	Secondary	Sat.	Sat.	125	None	-----
Vader	263	360	360	None	---	---	360	None	Active Planning
Toledo	21	500	500	None	---	---	300	None	Inactive
Castle Rock	15	320	320	None	---	---	320	None	Inactive
Kelso	4-2	7,000	8,000	Primary	Sat.	Sat.	5,200	None	-----
WASHINGTON TOTAL		118,730	226,530				164,465		
BASIN TOTAL		790,450	1,456,900				1,054,608		

* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns, significant institutions, resorts, recreational centers or other population centers.
 ** River mileage expressed thus, 14-2, indicates a source of pollution 2 miles upstream on a tributary which enters main stream at river mile 14.
 *** Includes industrial wastes discharged into municipal sewerage systems.
 **** NP = New Plant; E = Enlargement; A = Addition; R = Replacement; None = No project required; C = Connect to city system; I = Improved operations.

TABLE L

BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
COLUMBIA RIVER BASIN BELOW YAKIMA RIVER

NAME AND LOCATION	MILES ABOVE MOUTH	TYPE INDUSTRY	TYPE OF WASTE PRODUCED	TREATMENT OR OTHER POLLUTION CONTROL MEASURES			P.E. (B.O.D.) DISCHARGED TO WATERCOURSE	POLLUTION ABATEMENT NEED	CURRENT STATUS INDUSTRIAL ACTION
				DEGREE	ADEQUACY				
					CAP.Y.	OPR.			
OREGON									
Columbia River - Main Stem									
Doane Slaughterhouse - The Dalles	190	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Reynolds & Sons - The Dalles	190	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Seafert Bros & Co. - The Dalles	190	Fish & Fruit processor	Organic	None	---	---	3,000	New Plant	Inactive
Hood River Distillery - Hood River	169	Distillery	Organic	None	---	---	10,000	New Plant	Inactive
Apple Growers Ass'n - Hood River	169-5	Fruit processor	Organic	Minor	Unsat.	Unsat.	40,000	Additions	Inactive
Reynolds Aluminum Co. - Troutdale	118	Primary Metal industry	Inorganic	Minor	Sat.	Sat.	---	None	-----
Swift & Co. - Portland	105	Meat Products	San.Sewage	Prim.	Sat.	Sat.	350	None	-----
			Organic	Minor	Unsat.	Unsat.	50,000	Additions	Inactive
Portland Union Stockyards - Portland	105	Meat Products	Organic	None	---	---	1,000	New Plant	Inactive
Columbia River Packers Ass'n. #1 - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	10,000	None	-----
Columbia River Packers Ass'n. #2 - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	300	None	-----
Oregon Fur Producers - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	Unkown	None	-----
New England Fish Company - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	250	None	-----
Barby Packing Co. - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	1,250	None	-----
Columbia River Salmon Co. - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	1,250	None	-----
Sebastian Stewart Fish Co. - Astoria	10	Fish Products	C. anic	Minor	Sat.	Sat.	675	None	-----
Union Fisherman's Coop. - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	2,500	None	-----
Van Camp Sea Food Co. - Astoria	10	Fish Products	Organic	Minor	Sat.	Sat.	2,770	None	-----
Bioproducts of Oregon - Warrenton	8	Fish Products	Organic	Minor	Sat.	Sat.	Unkown	None	-----
San Juan Fish Co. - Warrenton	8-2	Fish Products	Organic	Minor	Sat.	Sat.	13,000	None	-----
Seaside Glass Co. - Warrenton	8-2	Fish Products	Organic	Minor	Sat.	Sat.	Unkown	None	-----
Point Adams Packing Co. - Hammond	6	Fish Products	Organic	Minor	Sat.	Sat.	1,250	None	-----
Walla Walla River									
	6313.9								
Leach-Weston Inc. - Weston	42-10	Canning & Preserving	Organic	Sec.	Unsat.	Unsat.	Variable	Additions	Active Planning
Rogers Canning Co. - Milton-Freewater	40	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Smith Frozen Foods - Milton-Freewater	40	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Umatilla Canning Co. - Milton-Freewater	40	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Umatilla Canning Co. Freezing Plant - Milton-Freewater	40	Frozen Foods	Organic	Sec.	Sat.	Sat.	0	None	-----
Utah Canning Co. - Milton-Freewater	40	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Umatilla River									
	6228.9								
Pendleton Canning & Frozen Foods - Pendleton	42	Canning & Preserving	Organic	Sec.	Unsat.	Unsat.	10,000	Enlargement	Inactive
Rogers Canning Co. - Athens	42-35	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Preston-Sheaffer Milling Co. - Athens	42-35	Flour Milling	Organic	Minor	Unsat.	Unsat.	1,500	Replacement	Inactive
Perry Bros. - Stanfield	12	Poultry	Organic	Prim.	Sat.	Sat.	0	None	-----
Willow Creek									
	6252.5								
Morrow Co. Creamery - Hesper	45	Dairy Products	Organic	None	---	---	100	New Plant	Inactive
John Day River									
	6217.9								
Prairie Creamery Co. - Prairie City	197	Dairy Products	Organic	None	---	---	100	New Plant	Inactive
Dale Slaughterhouse - John Day	175	Meat Products	Organic	Prim.	Sat.	Sat.	0	None	-----
Deschutes River									
	6203.6								
Central Oregon Coop. - Redmond	120	Dairy Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Cinder Butte Co. - Redmond	120	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
N.W. Poultry & Dairy Products - Redmond	120	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Swift & Co. - Redmond	120	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Juniper Products - Sisters	100-18	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Dart & Russell	50	Ore Processing	Inorganic	Prim.	Sat.	Sat.	---	None	-----
Hood River									
	6169.5								
Oregon Lumber Co. Hardwood Div. - Dee	12-2	Paperboard & other wood products	Organic	None	---	---	64,000	New Plant	Active Planning
Sandy River									
	6121.2								
Bissinger & Co. - Troutdale	1	Textile Mill	Organic	None	---	---	Unkown	New Plant	Inactive
Columbia Slough									
	6101.5								
Alderwood Dairy - Portland	9.7	Dairy Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Stearns & Welch Meat Co. - Portland	9.2	Meat Products	Organic	None	---	---	1,700	Connection	Inactive
Templeman Slaughterhouse - Portland	9.1	Meat Products	Organic	Prim.	Sat.	Sat.	100	None	-----
Pete Ness Hog Feeding Farm - Portland	9.0	Meat Products	Organic	None	---	---	1,850	Connection	Inactive
Associated Meat Packers - Portland	6.5	Meat Products	Organic	None	---	---	4,500	Connection	Inactive
J & C. Corvett Hog Feeding Farm -Portland	6.4	Meat Products	Organic	None	---	---	7,000	Connection	Inactive
B & B Hog Feeding Ranch - Portland	6.4	Meat Products	Organic	None	---	---	4,400	Connection	Inactive
Clea Panta Hog Feeding Farm - Portland	6.3	Meat Products	Organic	None	---	---	5,400	Connection	Inactive
Leatherman Oil Co. - Portland	6.3	Petroleum Products	Inorganic	Sec.	Sat.	Sat.	---	None	-----
Branders Meat Co. - Portland	6.2	Meat Products	Organic	None	---	---	17,000	Connection	Inactive
Tom Corvett Hog Feeding Farm-Portland	5.8	Meat Products	Organic	None	---	---	4,350	Connection	Inactive
Montag Stove Works - Portland	5.7	Feb. Metals	San.Sewage	Prim.	Sat.	Sat.	0	None	-----

(See footnotes at end of table)

TABLE L

BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
COLUMBIA RIVER BASIN BELOW YAKIMA RIVER

NAME AND LOCATION	MILES ABOVE MOUTH	TYPE INDUSTRY	TYPE OF WASTE PRODUCED	TREATMENT OR OTHER POLLUTION CONTROL MEASURES			P.E. (B.O.D.) DISCHARGED TO WATERCOURSE	POLLUTION ABATEMENT NEED ----	CURRENT STATUS INDUSTRIAL ACTION
				DEGREE USE	ADEQUACY				
					CAP'Y	OPR			
OREGON (Continued)									
Columbia Slough (Continued)									
Columbia Wool Scouring Co. - Portland	5.7	Textile Mill	Organic	None	---	---	Unknown	Connection	Inactive
Armour & Co. - Portland	5.3	Meat Products	Organic	None	---	---	10,800	Connection	Active Planning
Pacific Meat Co. - Portland	5.3	Meat Products	Organic	None	---	---	11,000	Connection	Inactive
Portland Provision Co. - Portland	5.2	Meat Products	Organic	None	---	---	Unknown	Connection	Inactive
Kenton Packing Co. - Portland	5.2	Meat Products	Organic	None	---	---	Unknown	Connection	Inactive
Portland Rendering Co. - Portland	4.7	Meat Products	Organic	None	---	---	Unknown	Connection	Inactive
Western States Rendering Co. - Portland	4.6	Meat Products	Organic	None	---	---	Unknown	Connection	Inactive
Geo Meat Co. - Portland	4.5	Meat Products	Organic	None	---	---	1,100	Connection	Inactive
Pacific Carbide & Alloys - Portland	4.5	Chemical & allied Prod.	Inorganic	Sec.	Sat.	Sat.	---	None	-----
Columbia Pickle Co. - Portland	1-4-5	Canning & Preserving	Organic	None	---	---	?	New Plant	Inactive
Electric Metallurgical Co. - Portland	1-6-1	Metal Products	Inorganic	None	---	---	Unknown	New Plant	Inactive
Multnomah Channel									
Hunt Foods Inc. - Seapppoo	9	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Fir-Ten Insulating Board Co. - St. Helens	3	Paperboard & other wood products	Organic	None	---	---	100,000	New Plant	Inactive
St. Helens Pulp & Paper Co. - St. Helens	2	Pulp & Paper Products	Organic	None	---	---	110,000	New Plant	Inactive
TOTAL IN BASIN							492,495		
Willamette River									
44 Industries & Industries (Inventory of Municipal and Industrial Waste Treatment Facilities - State of Oregon, 1953)			Organic Inorganic				2,802,600		
OREGON TOTAL							3,295,995		
WASHINGTON									
Columbia River - Main Stem									
Bailey Poultry - Kennewick	328	Meat Products	Organic	Minor	Sat.	Sat.	0	None	-----
North Pacific Grain Growers - Kennewick	328	Grain Elevators	Organic	Minor	Sat.	Sat.	Unknown	None	-----
Win City Livestock & Poultry Co.-Kennewick	328	Meat Products	Organic	Minor	Sat.	Sat.	2,500	None	-----
Continental Grain Co. - Pasco	328	Grain Elevators	Organic	Minor	Sat.	Sat.	Unknown	None	-----
Nelson Packing Co. - Pasco	328	Meat Products	Organic	Minor	Sat.	Sat.	0	None	-----
Allied Chemical Corp. - Nodges	325	Chem. & allied Products	Inorganic	Sec.	Sat.	Sat.	---	None	-----
Underwood Fruit & Warehouse Corp.-Underwood	168	Fruit Packing	San.Sewage	None	---	---	40	New Plant	Inactive
Washington Woolen Mills - Washougal	122	Textile Mill	Organic	None	---	---	450	New Plant	Inactive
Wt. Norway Poultry Co. - Washougal	122-3	Meat Products	San.Sewage	None	---	---	130	New Plant	Inactive
Crown Zellerbach Corp. - Camas	123	Pulp & Paper Products	Organic	Sec.	Sat.	Sat.	?	None	-----
		Grain Elevator	Organic	Minor	Unsat.	Sat.	1,500,000	Addition	Inactive
		Groundwood Paper & Misc.	Organic	Minor	Sat.	Sat.	900	None	-----
Vancouver Shipyards - Vancouver	108	Shipbuilding	San.Sewage	None	---	---	0	Connection	Inactive/
Pacific Building Material Co. - Vancouver	108-5	Stone & Clay Products	San.Sewage	None	---	---	5	Connection	Inactive
Vancouver Industrial Sewer	106								
Archer Daniels Midlands Co. - Vancouver		Grain Elevator	Organic	None	---	---	Unknown	New Plant	Inactive
California Packing Corp. - Vancouver		Canning & Preserving	Organic	Minor	Sat.	Sat.	76,000	None	-----
Great Western Milling Co. - Vancouver		Milling	San.Sewage	Minor	Sat.	Unsat.	5,200	New Plant	Inactive
Willprint Inc., Plant #9 - Vancouver		Paperboard & other Prod.	Organic	None	---	---	12	Impr. Opr.	Inactive
			San.Sewage	None	---	---	Unknown	None	-----
			San.Sewage	None	---	---	10	New Plant	Inactive
Washington Cannery		Canning & Preserving	Organic	Minor	Sat.	Sat.	2,400	None	-----
Vancouver Plywood Co. - Vancouver		Lumber & Wood Products	San.Sewage	None	---	---	130	Connection	Inactive
			Organic & Inorganic	None	---	---	Unknown	New Plant	Inactive
Columbia River Paper Mill - Vancouver	106	Pulp & Paper Products	Organic	None	---	---	431,000	New Plant	Active Planning
Columbia River Paper Mill Sawmill-Vancouver	106	Lumber & Wood Products	San.Sewage	None	---	---	50	New Plant	Inactive
Columbia Winery - Vancouver	106-10	Distillery	Organic	Minor	Sat.	Sat.	500	None	-----
Evergreen Packing Co. - Vancouver	106	Meat Products	Organic	Minor	Sat.	Sat.	0	None	-----
Fir Specialties Corp. - Vancouver	106	Millwork	San.Sewage	None	---	---	10	New Plant	Inactive
Valley Farms - Vancouver	106	Dairy Products	Organic	None	---	---	10	None	-----
Carborundum Co. - Vancouver	105	Chem. & Allied Products	Inorganic	None	---	---	---	New Plant	Inactive
Aluminum Co. of America - Vancouver	104	Primary Metal Products	San.Sewage	Minor	Sat.	Sat.	0	None	-----
			Inorganic	Prim.	Sat.	Sat.	---	None	-----
			San.Sewage	None	---	---	430	New Plant	Active Planning
General Chemical Co. - Vancouver	98-95	Chemical Products	Inorganic	Minor	Unsat.	Unsat.	Toxic Waste	New Plant	Inactive
Columbia Veneer Co. - Kalama	75	Lumber & Wood Products	Organic	Minor	Unsat.	Unsat.	Unknown	Improvement	Inactive
			San.Sewage	None	---	---	90	New Plant	Inactive
New England Fish Co. - Kalama	75	Fish Products	Organic	Minor	Unsat.	Unsat.	220	Addition	Inactive
Cloverdale Coop. Berry Assn. - Kalama	74	Food Products	Organic	None	---	---	700	None	-----
			San.Sewage	Minor	Sat.	Sat.	25	None	-----
Longview Fiber Co. - Longview	67.5	Pulp & Paper Products	Organic	Minor	Unsat.	Sat.	216,000	Addition	Inactive
			San.Sewage	None	---	---	570	New Plant	Active Planning
Continental Grain Co. - Longview	67	Grain Elevator	Organic	None	---	---	Unknown	New Plant	Inactive
			San.Sewage	None	---	---	20	New Plant	Inactive

(See footnotes at end of table)

TABLE L
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
COLUMBIA RIVER BASIN BELOW YAKIMA RIVER

NAME AND LOCATION	MILES ABOVE MOUTH	TYPE INDUSTRY	TYPE OF WASTE PRODUCED	TREATMENT OR OTHER POLLUTION CONTROL MEASURES			P.E. (B.O.D.) DISCHARGED TO WATERCOURSE	POLLUTION ABATEMENT NEED	CURRENT STATUS INDUSTRIAL ACTION
				DEGREE	CAP'Y	OPR.			
WASHINGTON (Continued)									
Columbia River - Main Stem (Continued)									
Interstate Packers Assn. - Longview	66.5	Canning & Preserving	Organic	Sec.	Sat.	Sat.	9	None	-----
Long Ball Lumber Co. - Longview	66.5	Saw Mill	Organic San.Sewage	Sec. None	Sat. ---	Sat. ---	400	None New Plant	----- Inactive
Weyerhaeuser Tissue Co. - Longview	65	Pulp & Sulfite Mill	Organic San.Sewage	Minor None	Sat. ---	Sat. ---	250,000 200	None New Plant	----- Inactive
Raynolds Aluminum Co. - Longview	63	Primary Metal Products	Inorganic San.Sewage	Minor None	Sat. ---	Sat. ---	120	None New Plant	----- Active Planning
Chinook Packing Co. - Chinook	7	Fish Products	Organic	None	---	---	470	None Plant	----- Inactive
Ilwaco Fish Co. - Ilwaco	4	Fish Products	Organic	None	---	---	900	None	-----
Keystone Packing Co. - Ilwaco	4	Fish Products	Organic	None	---	---	1,250	None Plant	----- Inactive
Walla Walla River									
Green Giant Co. - Waiilatup	22-38	Canning & Preserving	Organic	Sec.	Sat.	Sat.	0	None	-----
Joe B. Barber Packing Co. - Walla Walla		Meat Products	Organic	Minor	Sat.	Sat.	300	None	-----
Henry Stubbelsfield Co. - Walla Walla		Rendering Plant	Organic	Minor	Sat.	Unsat.	Unknown	Improvement	Inactive
Klickitat River									
Goldendale Meat Co. - Goldendale	20-20	Meat Products	Organic	Minor	Sat.	Unsat.	700	Improvement	Inactive
Klickitat Pine Box Co. - Goldendale	20-21	Lumber & Wood Products	San.Sewage	Minor	Unsat.	Unsat.	45	Connection	Inactive
White Salmon River									
Glanier Orchards - Ruma	168-8	Fruit Packing	Organic	Sec.	Sat.	Sat.	0	None	-----
White Salmon Dressed Meats - White Salmon		Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Lake River - Salmon Creek									
Clark County Dairyman's Coop. - Battleground	3-10	Dairy Products	Organic	None	---	---	2,000	New Plant	Active Planning
Yess Fryers - Battleground		Poultry Packing	Organic	Sec.	Sat.	Sat.	0	None	-----
Cliff Salinas - Battleground		Poultry Packing	Organic	None	---	---	Unknown	New Plant	Inactive
H. S. Paxton & Sons-Orchards		Poultry Packing	Organic	Sec.	Sat.	Sat.	0	None	-----
Lewis River									
Woodman Lumber Co. - Woodland	48-3	Saw Mill	Organic	Minor	Sat.	Unsat.	Unknown	Improvement	Inactive
Pyman Lumber Co. - Woodland	48-3	Saw Mill	Organic	Minor	Unsat.	Unsat.	Unknown	Addition	Inactive
Lewis River Meat Co. - Woodland	48-3	Meat Products	Organic	Sec.	Sat.	Sat.	0	None	-----
Woodland Valley Packing Co. - Woodland	48-3	Meat Products	Organic	Minor	Unsat.	Sat.	1,270	Addition	Inactive
Cowlitz River									
Hayfield Canning Co. - Hayfield	54	Canning & Preserving	Organic	None	---	---	35	None	-----
Lewis County Gravel Operations - Toledo	36	Mining	Inorganic	None	---	---	0	Settling Pond & Improvement	Inactive
S & W Dairy - Toledo	36	Dairy Products	Organic	None	---	---	30	None	-----
Dall Dairy - Winlock	26-0	Dairy Products	Organic	None	---	---	12	None	-----
Purvis Products Corp. - Winlock	26-9	Food Products	Inorganic & Organic	Sec.	Sat.	Sat.	None	None	-----
Central Sault Co. - Kalama	5	Fish Products	Organic	None	---	---	Unknown	New Plant	Inactive
Longview Meat Packing Co. - Longview	3	Meat Products	Organic	Minor	Sat.	Sat.	300	Additions	Inactive
Pacific Paperboard Co. - Longview	3	Paper & Paper Products	Organic San.Sewage	Minor Sec.	Unsat. Sat.	Unsat. Sat.	600 0	Additional None	Active Planning -----
WASHINGTON TOTAL							2,516,634		
BASIN TOTAL (Including Willamette River)							4,811,729		

* Industries having separate outlets and discharging wastes directly to watercourse.
 ** River mileage expressed thus, 14-2, indicates a source of pollution 2 miles upstream on a tributary which enters main stream at river mile 14.
 --- Minor = minor degree of treatment; Sec. = Secondary degree of treatment.
 P.E. = primary degree of treatment; Sec. = Secondary degree of treatment.
 --- New plant includes new treatment plant or other pollution control measures; Addition = additional treatment; Connection = connection to municipal sewage system; Replacement = replacement of an existing facility; Improvement = increased operation or maintenance of an existing facility.
 1/ Not operating.

APPENDIX

TABLE 1

COLUMBIA RIVER DRAINAGE AREAS

<u>Basin</u>	<u>Drainage Area in Square Miles</u>
Columbia Basin above Yakima River	95,930
Yakima River Basin	5,970
SNAKE River Basin	110,100*
Willamette River Basin	11,200
Columbia River Basin Below Yakima River:	
In Washington	9,680
In Oregon	<u>26,120</u>
Subtotal	<u>35,800</u>
TOTAL COLUMBIA RIVER BASIN	259,000

* Includes 1,100 sq. mi., which drains to the Columbia River.

Source: Bureau of Reclamation, Columbia River Report; and Corps of Engineers, Columbia River and Tributaries Review Report.

TABLE 2

CHARACTERISTICS OF COLUMBIA RIVER

Location on River	Miles Above Mouth	Existing Low Water Elevation feet-M.S.L.	Proposed Normal Water-Elev. feet-M.S.L.	Slope ft/mile	
				Existing	Proposed
Yakima River	335	320	340	1.39	0.00
Snake River	325	312	340		
Oregon Border	309	—	340		
McNary Dam	292	254	340		
John Day Dam	217.3	146	255	1.45	0.00
Celilo Falls (top)	202	128.5	160	.75	0.00
The Dalles Dam	192.5	72*	160	6.25	0.00
Bonneville Dam	145.3	72*	---	0.00	---
Sandy River	123	4 3.0	---		
Willamette River	99.5	4 1.2	---		
Multnomah Channel	85	4 0.42	---		
Cowlitz River	66.5	4 0.67	---		
Skamokawa River	33	- 2.78	---		
Pacific Ocean	0	- 4.03	---		

* Existing Normal Pool Elevation.

Source: Corps of Engineers Columbia River & Tributaries Review Report.

TABLE 3

CHARACTERISTICS OF PRINCIPAL TRIBUTARIES

Stream	Length (Miles)	Drainage Area (Sq. Miles)	Average Slope (Ft./mile)	Estimated Outflow (c.f.s.)	
				Average Annual	Minimum
Walla Walla River	72	1,760	55	580	0
Mill Creek	25	---	70	---	---
South Fork	25	---	128	170	72
Touchet River	74	---	44	235	6
<u>OREGON</u>					
Umatilla River	88	2,290	24	503	0
Willow Creek	70	890	41	28	0
John Day River	281	7,840	17	1,949	4
Thirty Mile Creek	---	---	---	---	---
Hay Creek	---	---	---	---	---
Mill Creek (Trib. to Bridge Creek)	---	---	---	5	---
Deschutes River	250	10,500	19	5,711	3,380
Crooked River	115	---	17	1,452	950
Squaw Creek	50	---	---	101	19
Shitike Creek	---	---	---	28	---
Tumalo Creek	---	---	---	61	7
Fifteen Mile Creek	---	---	70	30	0
Mill Creek	---	---	---	---	---
Hood River	39	335	190	1,070	165
Dry Creek	---	---	---	---	---
Dog River	---	---	---	---	---
Sandy River	51	510	137	2,570	100
Camp Creek	---	---	---	---	---
Lady Creek	---	---	---	---	---
Henry Creek	---	---	---	---	---
Alder Creek	---	---	---	---	---
Bull Run River	22	---	---	730	63
Gordon Creek	---	---	---	---	---

(Continued)

TABLE 3 -- CHARACTERISTICS OF PRINCIPAL TRIBUTARIES -- Continued

Stream	Length (Miles)	Drainage Area (Sq. Miles)	Average Slope (Ft/mile)	Estimated Outflow (c.f.s.)	
				Average Annual	Minimum
<u>OREGON</u> (Continued)					
Scappoose Creek	---	---	---	---	---
Elk Creek	---	---	---	---	---
Milton Creek	---	---	---	---	---
Fox Creek	---	---	---	---	---
Clatskanie River	---	52	---	33	5.8
Little Jack Creek	---	---	---	---	---
West Creek	---	---	---	---	---
O.K. Creek	---	---	---	---	---
Plympton Creek	---	---	---	---	---
Hunt Creek	---	---	---	---	0
Gnat Creek	---	---	---	---	4
Rock Creek	---	---	---	---	1
Mack Creek	---	---	---	---	---
Big Creek	---	---	---	70	15
Mill Creek	---	---	---	---	---
Little Creek	---	---	---	---	0.4
Bear Creek	---	---	---	5	1
Youngs River	---	32	---	---	21
Camp Creek	---	---	---	---	---
Lewis & Clark R.	---	---	---	100	15
Skipanon River	---	---	---	---	---
<u>WASHINGTON</u>					
Klickitat River	89	1,210	47	1,560	466
White Salmon River	38	384	114	1,020	0
Le-Bong Creek	---	---	---	---	---
Washougal River	36	240	77	---	57
LaCamas Creek	---	---	---	---	0

(Continued)

TABLE 3 -- CHARACTERISTICS OF PRINCIPAL TRIBUTARIES -- Continued

Stream	Length (Miles)	Drainage Area (Sq. Miles)	Average Slope (Ft/mile)	Estimated Outflow (c.f.s.)	
				Average Annual	Minimum
<u>WASHINGTON</u> (Cont.)					
Lake River	12	155	30	---	---
Salmon Creek	22	---	---	---	15
Lewis River	110	1,050	30	5,900	770
East Fork	32	---	28	713	29
Kalama River	43	224	127	1,029	208
Cowlitz River	133	2,490	8	9,600	998
Tilton River	26	---	31	---	66
Connolly Creek	---	---	---	---	---
Olequa River	10	---	---	---	1
Campbell Creek	---	---	---	---	---
Elokomin River	25	66	---	---	24
Cougar, Camp & Abe creeks	---	---	---	---	---
Freshwater Creek	---	---	---	---	---

TABLE 4
CLIMATOLOGICAL DATA

Station	Elevation in Feet, M.S.L.	Temperature Of			Precipitation, in Inches		Average Annual Snowfall in Inches	Average Length of Growing Season Days
		Mean Annual	Maximum	Minimum	Average Annual	Maximum	Minimum	
Walla Walla, Washington	952	53.1	113	- 29	17.0	23.1	10.1	219
Perth, Ore.	1,056	52.0	119	- 28	14.1	20.1	8.1	155
Arlington, Ore.	885	54.1	114	- 25	9.0	13.5	5.0	205
The Dalles, Ore.	98	53.1	115	- 30	15.5	43.6	6.4	196
Cascade Locks, Oregon	100	52.4	107	- 9	76.2	100.6	48.8	217
Portland, Oregon	30	53.1	107	- 2	42.0	67.2	26.1	263
Astoria, Oregon	231	51.2	101	- 10	76.3	114.0	49.4	273
Heppner, Oregon	1,550	50.1	110	- 21	13.3	19.2	7.8	168
Dayville, Ore.	2,400	50.5	111	- 33	11.5	17.4	7.5	132
Bend, Oregon	3,632	46.7	104	- 26	12.7	25.8	8.1	91
Kennewick, Washington	392	53.7	115	- 29	7.1	12.2	3.6	181
Wind River, Washington	1,150	48.4	107	- 13	86.7	135.9	54.2	134
Longview, Wash.	12	51.5	105	- 20	40.6	58.0	28.3	171
Government Camp, Oregon	3,890	42.3	97	- 16	84.6	124.4	56.8	*

* Freezing occurs every month of the year.

Source: Corps of Engineers, Columbia River and Tributaries Review Report.

TABLE 5
LAND DISTRIBUTION BY USE
1940

Use	Oregon (Acres)	Washington (Acres)	Total (Acres)
Agricultural Land	(6,612,271)	(2,375,187)	(8,987,458)
Irrigated Land	196,680	40,800	237,480
Permanent Pasture	4,388,138	1,190,575	5,578,713
Non-Irrigated	2,027,453	1,143,812	3,171,265
Range Land	1,872,104	228,172	2,100,276
Forest Area	7,607,150*	3,700,912	11,308,062
Miscellaneous	160,693	33,213	193,906
Totals	16,252,218	6,337,484	22,589,702

* This includes 4,434,645 acres of Forest Range.

Source: Adapted from the Corps of Engineers, Columbia River & Tributaries Review Report.

TABLE 6
PUBLIC LANDS & RESERVATIONS
1948

	Oregon (Acres)	Washington (Acres)	Total (Acres)
National Forests	4,562,324	1,353,455	5,915,779
Other Federal Lands	1,585,252	108,301	1,693,553
State, County & Municipal Lands	231,567	290,848	522,415
Indian Reservations	670,341	250,057	920,398
Totals	7,049,484	2,002,661	9,052,145

Source: Corps of Engineers, Columbia River and Tributaries Review Report.

TABLE 7
POPULATION GROWTH AND DISTRIBUTION

State	1920	1930	1940	Urban*	1950		Percent Rural
					Rural	Total	
Washington	114,600	145,300	172,500	142,100	110,400	252,500	43.7
Oregon	185,100	208,100	225,600	484,000**	86,000	570,000	15
Basin Total	299,700	351,400	398,100	626,100	196,400	822,500	23.8

* Incorporated and unincorporated places of over 500 population as extracted from the 1950 census of population, Advance Reports.

** Includes that part of the Portland Metropolitan Area (estimated population 20,000) which will drain to the Columbia River when the sewered population is connected to the treatment plant. Figures for previous years include only that part of Portland which then drained to the Basin.

TABLE 8
DISTRIBUTION OF EMPLOYED INDUSTRIAL WORKERS
1951

Type of Industry	Number Employed*			Percent
	Oregon	Washington	Total	
Mining & Quarrying	180	60	240	.2
Contract Construction	5,600	6,200	11,800	10
Manufacturing	(24,600)	(24,000)	(48,600)	(41.3)
Lumber & Allied Ind.	11,800	10,000	21,800	18.5
Food & Kindred Prod.	3,700	1,500	5,200	4.4
Other Goods	9,100	12,500	21,600	18.4
Transportation-- Communications & Utilities	7,000	4,400	11,400	9.7
Wholesale & Retail Trade	19,300	11,450	30,750	26.2
Finance, Insurance & Real Estate	2,950	1,300	4,250	3.6
Services & Professions	5,600	4,600	10,200	8.7
Miscellaneous	250	125	375	.3
Total in Basin	65,480	52,135	117,615	100.0

* Represents approximately 75% of all wage earners in the basin. Coverage under the State Employment Security Acts of Oregon and Washington is similar, the only major difference being that the Oregon figures include establishments employing four or more persons while Washington figures include establishments employing one or more persons.

Source: Oregon Employment & Payrolls in Covered Industries, April, 1951; and Employment and Payrolls in Washington State by County and By Industry, March 1951.

TABLE 9
AGRICULTURAL RESOURCES
1945

Item	Oregon	Washington	Total
Number of Farms	10,397	11,702	22,099
Av. Size of Farms (Acres)	815	178	478
Land in Farms:			
Total (Acres)	8,477,126	2,088,607	10,565,733
Percent of Basin Area	37.0%	9.1%	46.0%
Cropland (Acres)	2,137,735	821,128	2,958,863
All Other Uses	6,339,391	1,267,479	7,606,870
Value of Land & Buildings			
Per Acre (Dollars)	\$21	\$52	\$27
Total Value (\$1,000)	\$175,640	\$109,056	\$284,696

Source: Corps of Engineers, Columbia River & Tributaries Review Report.

TABLE 10
GROSS FARM INCOME
(Thousands of Dollars)
1944

Source of Income	Oregon	Washington	Total
Livestock & Livestock Products Sold	\$22,940,185	\$14,687,539	\$37,627,724
Crops Sold	48,223,979	18,364,684	66,588,663
Forest Products Sold	202,700	186,622	389,322
Farm Products Used by Farm Households	<u>3,589,096</u>	<u>3,131,345</u>	<u>6,720,441</u>
Total Gross Farm Income	\$74,955,960	\$36,370,190	\$111,326,150

Source: Corps of Engineers, Columbia River & Tributaries Review Report.

TABLE 11
IRRIGATION DEVELOPMENT
1951

Irrigated Land (Acres)			
Project Name	Existing	Source of Supply	
<u>EXISTING PROJECTS</u>			
Main Stem of Columbia River	3,850 ^{1/}	Columbia River	
Walla Walla River	37,596	Sub-basin streams	
Umatilla River	37,000	Sub-basin streams	
John Day River	43,736	Sub-basin streams	
Deschutes River	107,800	Sub-basin streams	
Hood River	25,100	Sub-basin streams	
Klickitat River	7,250	Sub-basin streams	
White Salmon River	5,482	Sub-basin streams	
Kennewick Area	10,140	Yakima River	
Total	285,614		
	Supple- mental	New Land	
<u>AUTHORIZED PROJECTS</u>			
Deschutes River Basin			
Warm Springs	---	6,500	Warm Springs River
Deschutes North Unit (Under Construction)	---	50,000	Deschutes River
Total		56,500	
<u>PROPOSED PROJECTS</u>			
Columbia River-Main Stem			
Horse Heaven (McNary)	---	127,000	Columbia River
Cold Springs (McNary)	---	36,700	Columbia River
Arlington	---	11,500	Columbia River
Roosevelt	---	1,500	Columbia River
The Dalles West Unit	1,500	3,030	Columbia River
Walla Walla River Basin			
Walla Walla	12,400	---	Mill Creek
Dayton	8,000	6,000	Touchet River
Milton-Freewater	20,000	28,000	Walla Walla River
Umatilla River Basin			
Pendleton	---	30,000	Umatilla River
Birch Creek Diversion	---	2,500	Birch Creek
Willow Creek Basin			
Heppner	3,000	---	Willow Creek

^{1/} Includes 1,450 acres near Pasco, in Franklin County, Washington.
(Continued)

TABLE 11 -- IRRIGATION DEVELOPMENT 1951 -- Continued

Project Name	Irrigated Land (Acres)		Source of Supply
	Supple- mental	New Land	
PROPOSED PROJECTS (Cont.)			
John Day River Basin			
Upper John Day	14,200	---	John Day River
Beech Creek	400	---	Beech Creek
Butter Creek ^{2/}	8,000	4,000	Camas Creek
Fox Creek	500	2,500	Fox Creek
John Day	---	227,000	John Day River (Or Columbia R.)
Deschutes River Basin			
Deschutes	47,000	---	Deschutes River
Paulina	1,700	3,500	Beaver Creek
Post	1,800	6,500	Crooked River
Crooked River	9,990	10,220	Crooked River
Wapinitia	2,200	21,200	White River
Hood River Basin			
East Fork Irrigation District	11,000	---	Neal Creek
Kennewick Division	---	16,690	Yakima River
Klickitat River Basin			
Glenwood	7,000	13,000	Klickitat River
Upper Horse Heaven	---	140,000	Klickitat River
Klickitat Extension ^{3/}	---	---	Klickitat River
Little White Salmon River			
Underwood	---	40	Little White Salmon River
Wind River Basin			
Carson	---	200	Panther Creek
Cowlitz River Basin			
Jackson Prairie	---	30,000	Tilton River
Total, Proposed	148,690	721,080	
Total, Authorized & Proposed	148,690	777,580	
GRAND TOTAL	148,690	1,063,194	

^{2/} This land is in the Umatilla basin--Camas Creek is tributary to the John Day River.

^{3/} Water to be diverted to Yakima basin.

Source: Bureau of Reclamation, United States Department of Interior.

TABLE 12

UNRESERVED SAW TIMBER*
January 1, 1945

Million Board Feet, Scribner Rule

Privately Owned	40,528
National Forests	54,979
Other Publicly Owned and Managed	<u>11,967</u>
Total for Sub-basin	107,474

* Adapted from Corps of Engineers, Columbia River and Tributaries Review Report.

TABLE 13

LOG PRODUCTION*
(Millions of Board Feet, Log Scale)
1941 - 1948

Year	Oregon	Washington	Total
1941	926	1,368	2,294
1942	875	1,307	2,182
1943	751	1,196	1,947
1945	602	877	1,479
1946	706	954	1,660
1947	802	---	---
1948	770	1,008	1,778

* Source: Production of Logs in Oregon & Washington, 1925 - 1948; Pacific Northwest Forest & Range Experiment Station.

TABLE 14

ANNUAL PRODUCTION AND VALUE OF THE SALMON
FISHERY ATTRIBUTABLE TO THE COLUMBIA RIVER (1)

Species	Fish Production (Thousands of pounds)					Total Value (4)
	River	Troll	Sport (2)	Indian Subsistence (2) (3)	Total	
Chinook	16,078	6,967	---	530	25,208	\$15,567,000
Silver	1,222	926	---	5	2,206	1,126,000
Blueback	208	---	---	15	223	143,000
Chum	1,539	---	---	---	1,539	462,000
Steelhead	1,212	154	---	150	1,830	1,307,000
TOTALS	20,259	8,047	2,000 ⁽⁵⁾	700	31,006	\$18,605,000

- (1) Production data are based upon the average annual catch, 1940-1949, inclusive, and represents all salmon spawned in entire Columbia River Basin.
- (2) Estimated prices of \$0.50 and \$1.75 per pound are used for the Indian and sports fisheries, respectively.
- (3) The Indian catch data are for closed seasons only, while Indian open season catch is included in commercial fishery totals.
- (4) Values given are for the canned product in 1950, as reported by the Pacific Fisherman Yearbook at the first wholesale level.
- (5) Not broken down as to species.

TABLE 15

MANUFACTURING
1947

Establishments	366
Wage Earners	41,500
Wages	\$123,027,000
Value Added by Manufacturing	\$285,415,000

Adapted from U. S. Department of Commerce, Bureau of the Census, Census of Manufactures - 1947.

TABLE 16
HYDROELECTRIC POWER PROJECTS *

Name	Operating Utility	Name Plate Rating (Kilowatts)	Name of River
EXISTING			
Bonneville	Corps of Engineers	518,400	Columbia
Merwin (Ariel)	Pacific Power & Light Co.	90,000	Lewis
Station "O"	Portland General Electric Co.	21,000	Sandy
Condit	Pacific Power & Light Co.	9,600	White Salmon
Powerdale	Pacific Power & Light Co.	6,000	Hood River
Cove	Pacific Power & Light Co.	2,600	Deschutes
Walla Walla River	Pacific Power & Light Co.	2,435	Walla Walla
Tygh Valley	Pacific Power & Light Co.	2,250	Deschutes
Bend	Pacific Power & Light Co.	1,110	Deschutes
Fremont	California Pacific Utilities	1,100	John Day
Milton	Milton City	1,000	Walla Walla
Subtotal		655,495	
UNDER CONSTRUCTION			
McNary	Corps of Engineers	980,000	Columbia
The Dalles	Corps of Engineers	1,092,000	Columbia
Yale	Pacific Power & Light Co.	100,000	Lewis
Subtotal		2,172,000	
AUTHORIZED			
John Day	Corps of Engineers	1,105,000	Columbia
TOTAL		3,932,495	

* Includes plants of 1,000 kilowatts capacity, or greater.

TABLE 17
COLUMBIA RIVER COMMERCE - 1950

Section of Columbia River	Receipts Tons	Shipments Tons	Total Tons	Through Traf- fic Tons
<u>Mouth to Vancouver and Portland</u>				
Foreign	107,751	1,322,741	1,430,492	
Coastwise	6,407,005	1,224,254	7,631,259	
Internal	(6,750,713)	1/	6,750,713	
Local Receipts	1,233,816		1,233,816	
Subtotal			17,046,280	1,531,678
<u>Vancouver to The Dalles</u>				
Internal	(1,969,984)	1/	1,969,984	
Local Receipts	42,783		42,783	
Subtotal			2,012,767	832,535
<u>The Dalles to McNary</u>	(577,303)	1/	577,303	256,050
<u>At McNary</u>	(14,346)	1/	14,346	
<u>McNary to Kennawick</u>	(241,704)	1/	241,704	
<u>Oregon Slough</u>	(627,123)	1/	627,877	2/
<u>Multnomah Channel</u>	(971,898)	1/	996,629	2/
<u>Columbia Slough</u>	(78,008)	1/	78,008	
<u>Westport Slough</u>				
Foreign		3,852		
Coastwise		72,235		
Internal	(260,135)	1/		
Subtotal			338,793	2/
<u>Cowlitz River</u>	(153,787)	1/	154,539	2/
<u>Minor Tributaries and Channels</u>				
Foreign		5,973		
Coastwise	47,786	22,134		
Internal	(1,873,542)	1/		
Subtotal			2,084,863	2/
<u>Miscellaneous Local Receipts</u>	164,236	2/		
TOTALS	14,762,649	9,410,460	24,173,109	2,620,263
NET TOTAL 1/	--	--	17,413,838	--

1/ Combined receipts and shipments. Only half of these are included in the net total.

2/ Total tonnages adjusted to include miscellaneous local receipts.

TABLE 18
RECREATION

Name and Location	Number of Facilities	Number of Recreation Residences	Number of Visitors
OREGON			
National Forests (1950)			
Deschutes	93	222	199,375
Mount Hood	102	412	720,000
Ochoco	8	1	17,300
Malheur	11	1	20,200
Whitman	6	5	14,000
Umatilla	15	9	34,100
Subtotal	235	650	1,004,975
Bonneville Dam (1949)	1	---	643,649
State Parks (1951)			
River, Waterfall, and Spring	8	---	455,151
Overlook, and Crests	4	---	658,800
Other	49	---	138,651 *
Subtotal	61	---	1,252,602
Total for Oregon	297	650	2,901,226
WASHINGTON			
National Forests (1950)			
Gifford Pinchot	77	1	105,931
Umatilla	5	14	6,715
Subtotal	82	15	112,646
Rainier National Park (1951)			
Ohanapocosh	1	---	139,157
State Parks (1951)	7	---	319,111
Total for Washington	90	15	570,914
GRAND TOTAL	387	665	3,472,140

* Number of Visitors is for the 4 major facilities -- Data for the remaining 45 is unknown.

Source: U. S. Forest Service, Department of Agriculture; Oregon State Highway Department; Washington State Parks and Recreation Commission; Corps of Engineers, U. S. Army; and local data.

TABLE 19
MUNICIPAL WATER SUPPLIES

Community	Population Served Estimated	Source of Supply	Treatment
<u>OREGON</u>			
<u>Main Stem Columbia River</u>			
McNary 1/	3,000	Columbia River	Filtration & Chlor.
Arlington 1/	700	Columbia River	Filtration & Chlor.
Bridal Veil	160	Small creeks	Chlorination
Clifton	100	Columbia R. & creek	Chlorination
St. Helens	6,000	Wells & Milton Ck. Aux.	Chlorination
Jantzen Beach	Variable	Wells	Chlorination
Wood Village	1,700	Well	None
Umatilla	880	Wells	None
Bonneville	500	Well	None
Troutdale	500	Springs	Chlorination
Fairview	425	Wells	None
Columbia City	400	Springs	None
Mosier	250	Well	None
Wauna	200	Well	None
Oklahoma Hills	175	Springs	None
Rainbow Water District	165	Spring & unnamed creek	None
Boardman	120	Wells	None
<u>Walla Walla River Basin</u>			
Milton-Freewater 1/	3,850	S. Fork of Walla Walla River	Filtration & Chlor.
Weston	680	Well & spring	Chlorination
Helix	175	Wells	None
Umapine	120	Well	None
<u>Umatilla River Basin</u>			
Pendleton	12,000	Spring & wells Umatilla River (Infiltration gallery)	Chlorination
Hermiston	3,800	Wells	None
Ordance	1,050	Well	None
Pilot Rock	850	Wells	Chlorination
Stanfield	800	Well	Chlorination

See footnote at end of table.

TABLE 19 -- MUNICIPAL WATER SUPPLIES -- Continued

Community	Population Served Estimated	Source of Supply	Treatment
<u>OREGON (Cont'd)</u>			
<u>Umatilla River Basin (Cont'd)</u>			
Athens	750	Wells	None
Echo	450	Well	Chlorination
Adams	150	Well	None
Rieth	135	Well	None
<u>Willow Creek Basin</u>			
Heppner	1,650	Wells	None
Ione	260	Well	Chlorination
Lexington	230	Well	None
<u>John Day River Basin</u>			
Condon 1/	1,000	Hay Creek	Chlorination
Mitchell	270	Mill Creek - Trib.	
		Bridge Creek	Chlorination
John Day	1,600	Springs & well	None
Prairie City	820	Springs	None
Fossil	650	Well & spring	Chlorination
Canyon City	500	Springs	None
Mt. Vernon	450	Well	Chlorination
Kinzua	350	Wells	None
Dayville	280	Springs	None
Long Creek	275	Springs	None
Monument	230	Boyer Light Co. well	None
Spray	150	Springs & well	None
<u>Deschutes River Basin</u>			
Bend	11,500	Tumalo Creek & spring	Chlorination
Redmond	3,300	Deschutes River & irrigation ditch	Chlorination— Filtration & Chlorination
Sisters	700	Squaw & Pole creeks	Chlorination
Warm Springs Indian Agency	400	Shitike Creek	Chlorination
Wamic	110	Irrigation Ditch	None
Prineville	3,500	Springs & well	Chlorination
Deschutes Valley I.D. (Includes Madras)	2,400	Springs	Chlorination

See footnote at end of table.

TABLE 19 -- MUNICIPAL WATER SUPPLIES -- Continued

Community	Population Served Estimated	Source of Supply	Treatment
OREGON (Cont'd)			
<u>Deschutes River Basin (Cont'd)</u>			
Moro	350	Wells	None
Gilchrist	350	Wells	None
Shevlin	310	Well	None
Maupin	310	Springs	None
Wasco	300	Wells	None
Terrebonne	200	Well	None (Chlorinator available)
Grass Valley	200	Wells	None
Antelope	100	Springs	None
Frieda	100	Dant & Russell Co. spring	None
<u>Fifteen Mile Creek</u>			
Dufur	400	Fifteen Mile Creek	Chlorination
<u>Mill Creek</u>			
The Dalles 1/	8,000	Mill Cr.; & Dog River, Trib. of Hood River	Filtration & chlorination
<u>Hood River Basin</u>			
Hood River	4,000	Cold Springs	None
Cascade Locks	750	Dry Creek	Chlorination
<u>Sandy River Basin</u>			
Portland	478,000	Bull Run River	Chlorination
Zig Zag W. Co.	1,900	Lady Creek	None
Rhododendron	900	Henry Creek	Chlorination
Corbett	365	Gordon Creek	Chlorination
Gov't. Camp W. Co.	225	Camp Creek	None
Alder Creek	150	Alder Creek	None
Sandy	1,000	Spring	None
Springdale	150	Springs	None
<u>Scappoose Creek Basin</u>			
Warren	200	West Fk. Elk Creek	None
<u>Milton Creek Basin</u>			
Scappoose	1,150	Gourley Creek	Chlorination

See footnote at end of table.

TABLE 19 -- MUNICIPAL WATER SUPPLIES -- Continued

Community	Population Served Estimated	Source of Supply	Treatment
<u>OREGON (Cont'd)</u>			
<u>Fox Creek Basin</u>			
Rainier	1,300	Fox Creek	Chlorination
<u>Clatskanie River Basin</u>			
Clatskanie	1,000	West Creek, Trib. of Conyers Creek	Chlorination
Prescott 1/	120	Little Jack Creek	Chlorination
<u>O.K. Creek</u>			
Westland Water Ass'n.	100	O.K. Creek	None
<u>Plympton Creek</u>			
Westport	265	Plympton Creek	Chlorination
<u>Hunt Creek</u>			
Bradwood	140	Hunt Creek	Chlorination
<u>Gnat Creek Basin</u>			
Brownsmead	150	Mack Creek, Trib. of Rock Creek	None
<u>Big Creek Basin</u>			
Wickiup Water Dist.	1,000	Little Creek	Chlorination
Knappa Water District	300	Mill Creek	Chlorination
<u>Bear Creek</u>			
Astoria	12,500	Bear Creek	Chlorination
<u>Youngs River Basin</u>			
Warrenton	3,500	Lewis & Clark R. & S. Fk. Camp Creek	Chlorination
TOTAL SURFACE WATER	537,505		
TOTAL GROUND WATER	<u>52,990</u>		
OREGON TOTAL	590,495		

See footnote at end of table.

TABLE 19 -- MUNICIPAL WATER SUPPLIES -- Continued

Community	Population Served Estimated	Source of Supply	Treatment
<u>WASHINGTON</u>			
<u>Main Stem Columbia River</u>			
Pasco	10,000	Columbia River	Filtration & Chlor.
Kennewick 1/	10,000	Columbia River	Infiltr., & Chlor.
North McNary	100	Columbia River	Filtration & Chlor.
Vancouver	48,250	Springs & wells	Chlorination
Camas	6,400	Springs & wells	Chlorination
Washougal	3,000	Wells	None
Stevenson	900	Springs	None
Ridgefield	750	Wells	None
North Bonneville	500	Well	None
Wishram	300	Well & spring	None
Skamokawa	270	Spring	None
Carson	125	Springs	None
<u>Walla Walla River Basin (See Oregon Section Above)</u>			
Walla Walla	25,000	Mill Creek & wells	Chlorination
Dayton 1/	3,000	Touchet River	Filtration & Chlor.
College Place	3,200	Wells	None
Walla Walla Peni- tentiary	1,800	Wells	None
Waitsburg	1,000	Wells & spring	Chlorination
Farm Labor Camp	750	Well	None
Veterans Hospital (Walla Walla)	450	Wells	Chlorination
Wallula	300	Well	None
Prescott	250	Wells & spring	None
<u>Klickitat River Basin</u>			
Klickitat	700	Klickitat River	Filtration & Chlor.
Goldendale	2,100	Springs	None
<u>White Salmon River Basin</u>			
White Salmon 1/	1,400	Creek (Trib. of White Salmon R.)	None
Bingen	750	Wells & White Salmon City Auxiliary	None
Trout Lake	300	Spring	None

See footnote at end of table.

TABLE 19 -- MUNICIPAL WATER SUPPLIES -- Continued

Community	Population Served Estimated	Source of Supply	Treatment
<u>WASHINGTON (Cont'd)</u>			
<u>Lake River--Salmon Creek Basin</u>			
Battleground	700	Wells	None
<u>Lewis River Basin</u>			
Woodland	1,200	Lewis River	Chlorination
Yacolt	400	Big Creek	Chlorination
LaCenter	200	Well	None
<u>Kalama River</u>			
Kalama	1,500	Kalama River	Chlorination
<u>Cowlitz River Basin</u>			
Longview	20,300	Cowlitz River	Filtration & Chlor.
Kelso	10,000	Cowlitz River	Filtration & Chlor.
Morton	1,100	Connelly Creek	Chlorination
Ryderwood	950	Trib. of Campbell Creek	Chlorination
Vader 1/	450	Agran Creek	Chlorination
Castle Rock	1,250	Wells	Chlorination
Winlock	1,100	Wells	None
Toledo	600	Springs	Chlorination
Randle	200	Wells	None
<u>Elokomin River Basin</u>			
Cathlamet	750	Cougar, Camp & Abe creeks	Chlorination
<u>Black Lake</u>			
Ilwaco	850	Black Lake	Filtration & Chlor.
<u>Fresh Water Creek</u>			
Chinook	400	Fresh Water Creek	Chlorination
TOTAL SURFACE WATER	88,100		
TOTAL GROUND WATER	<u>75,445</u>		
WASHINGTON TOTAL	<u>163,545</u>		
GRAND TOTAL	748,040		

1/ Has supplemental ground water supply.

TABLE 20

INDUSTRIAL WATER SUPPLIES

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
OREGON			
<u>Columbia River Main Stem</u>			
Union Pacific Railroad Co., Arlington	Columbia River	None	Boiler feed
Beaudoin & Sons, The Dalles	Ground water	None	Cooling
The Dalles Lumber & Mfg. Co., The Dalles	Well	None	Log pond
Hood River Box & Veneer Co., Hood River	Spring	None	Boiler feed
Neal Creek Lumber Co. Hood River	Ground water	None	Boiler feed & cooling
Reynolds Metal Co., Troutdale	Well	None	Dilution
Swift & Co., Portland	Wells	As required	Processing & cooling
Western Wax Paper Co., Portland	Well	None	---
Stauffer Chemical Co., Portland	Well	None	---
Moore Dry Kiln Co., Portland	Well	None	Cooling
Pope & Talbot Lbr. Co., St. Helens	Columbia River	None	Boiler feed
Rainier Creamery, Rainier	Well*	None	Cooling
Wauna Lumber Co., Wauna	Columbia River	None	Cooling
Pacific Power & Light Co., Astoria	-- Well*	Chlorinated	Drinking
Columber River Packers Assn. Plants #1 & 2, Astoria	Youngs Bay*	None	Cooling
Union Fisherman's Coop., Astoria	Columbia River*	None	Cooling
Sebastian Stewart, Astoria	Columbia River	Chlorinate	Wash down
New England Fish Co., Astoria	Columbia River*	None	Cooling
Barbey Packing Co. Astoria	Columbia River	None	Cooling

See footnote at end of table.

TABLE 20 -- INDUSTRIAL WATER SUPPLIES -- Continued

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
<u>OREGON (Cont'd)</u>			
<u>Columbia River Main Stem (Cont'd)</u>			
Var Camp Sea Food Co., Astoria	Columbia River	None	Cooling
Bioproducts of Oregon Ltd., Warrenton	Columbia River	None	Cooling & scrubbing
<u>Columbia Slough</u>			
National Biscuit Co.	Well	None	Cooling
Western States Rendering Co.	Well	None	---
Portland Provision Co.	Well	None	---
Portland Rendering Co.	Well	None	---
Branders Meat Co.	Well	None	---
Kenton Packing Co.	Well	None	---
Pacific Meat Co.	Well	None	---
Armour & Co.	Well	As required	---
Stearns & Welch Meat Co.	Well	None	---
Pacific Carbide & Alloys Co.	Well	None	Cooling
Laurel Farms Portland	Well	None	---
<u>Multnomah Channel</u>			
St. Helens Pulp & Paper Co., St. Helens	Multnomah Channel Filtration		Processing & cooling
Fir-Tex Insulating Board Co., St. Helens	Scappoose Bay	Sedimentation	Boiler feed & processing
<u>Walla Walla River Basin</u>			
Rogers Canning Co., Milton-Freewater	Wells*	None	Processing
Milton Nursery, Milton-Freewater	Well	None	---
Utah Canning Co., Milton-Freewater	Wells*	None	Processing
Umatilla Canning Co., Milton-Freewater	Wells*	None	Processing
Eastern Oregon Canning Co., Weston	Wells & Pine Creek*	None	Processing

See footnote at end of table.

TABLE 20 -- INDUSTRIAL WATER SUPPLIES -- Continued

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
<u>OREGON (Cont'd)</u>			
<u>Umatilla River Basin</u>			
Smith Canning & Freezing Co., Pendleton	Wells*	---	Processing
Harris Pine Mills, Pendleton	Umatilla River	None	Cooling
Rogers Canning Co., Athena	Wells*	None	Processing
Union Pacific Railroad Co., Hinkle	Wells	Variable	---
Pendleton Airport, Pendleton	Well	None	---
Jones-Scott Sand & Gravel Co., Castle Rock	Well	None	---
Ordnance Depot--U.S. Army, Ordnance	Wells	Chlorination	---
<u>Willow Creek Basin</u>			
Morrow County Creamery, Heppner	Well	---	---
Heppner Lumber Co., Heppner	Well	---	---
<u>John Day River Basin</u>			
Dale Slaughterhouse, John Day	Well	None	---
Lamford Lumber Co., Mt. Vernon	Well & John Day River*	None	Cooling
Hudspeth Sawmill Co., Mitchell	Well, spring, & West Branch of Bridge Creek	None	Boiler feed
Kinsua Pine Mills Co., Kinsua	So. Fork of Thirty Mile Cr.	None	Cooling
Oregon Lumber Co., Sawmills	Middle Fork, Bridge Creek, Clear Ck., Davis Ck., & Vinegar Ck.	None	---
California Pacific Utilities, Granite	Olive Lake	Chlorinated	---
Mitchell Pine Lumber Co., Mitchell	Spring	None	---

See footnote at end of table.

TABLE 20 -- INDUSTRIAL WATER SUPPLIES -- Continued

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
<u>OREGON (Cont'd)</u>			
<u>Deschutes River Basin</u>			
Brooks-Scanlon Lbr. Co., Bend	Little Deschutes River*	None	Boiler feed
Shevlin-Hixon Co., Bend	Paulina Creek	---	Power & cooling
Warm Springs Lbr. Co., Warm Springs	Shitike Creek*	None	Boiler feed
Dant & Russell, Maupin	Well*	None	Domestic
Pine Products Corp., Prineville	Artesian well	None	Boiler feed
Pine Moulding Co., Prineville	Artesian well	None	Domestic & boiler feed
Hudspeth Sawmill Co., Prineville	Well	None	Processing & boiler feed
Gilchrist Lumber Co., Gilchrist	Little Deschutes River	---	---
Mid-State Lbr. & Supply Co., Prineville	Well	None	Boiler feed
<u>Fifteen Mile Creek</u>			
Seufert Bros., The Dalles	Wells	None	Boiler feed & processing; floor wash- ing
<u>Hood River Basin</u>			
Oregon Lumber Co., Dee	Cold Springs	Filtr. & other treatment	Processing & boiler feed
Apple Growers Assn., Hood River	Odell Creek & spring	---	---
Duckwall Bros. Inc., Hood River	Paradise & Coe creeks*	Sedimentation	Cooling
Hood River Box & Veneer Co., Hood River	Spring	None	Domestic & boiler feed
<u>Sandy River</u>			
Bissinger & Co., Troutdale	Spring	---	---

See footnote at end of table.

TABLE 20 -- INDUSTRIAL WATER SUPPLIES -- Continued

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
OREGON (Cont'd)			
Milton Creek			
St. Helens Wood Products Co., St. Helens	Milton Creek*	Boiler compound	Boiler feed
Hunt Creek			
Columbia Hudson Lbr. Co., Bradwood	Hunt Creek*	Chlorination	Domestic & boiler feed
Plympton Creek			
Shepard Morse Lbr. Co., Westport Spokane, Portland & Seattle Railroad, Westport	Plympton Creek	Chlorination & Sedimentation	Domestic & boiler feed
	Plympton Creek	---	---
Skipanon River			
San Juan Fishing & Packing Co. of Oregon, Warrenton	Skipanon River	None	Cooling
WASHINGTON			
Columbia River Main Stem			
Allied Chemicals & Dye Corp., Hedges	Columbia River	---	Processing
Bingen Sand & Gravel Co., Bingen	Well	None	Gravel washing
Underwood Fruit & Warehouse Corp., Underwood	Springs	None	Fruit washing
Mt. Norway Poultry Co., Washougal	Well	None	Processing
Crown Zellerbach Corp., Camas	LaCamas Lake Wells Columbia River	Filtered None Filtered	General Pulp & paper Processing

See footnote at end of table.

TABLE 20 -- INDUSTRIAL WATER SUPPLIES -- Continued

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
<u>WASHINGTON (Cont'd)</u>			
<u>Columbia River Main Stem (Cont'd)</u>			
Aluminum Co. of America, Vancouver	Wells	Chlorination	General
Port of Vancouver Water System, Vancouver	Wells	None	General
Buffalo Electro-Chemical Co., Vancouver	Wells	None	Processing
Carborundum Co., Vancouver	Well*	None	Processing
Clark County Meat Co., Vancouver	Wells	None	---
Columbia River Packers, Vancouver	Springs	None	---
Columbia River Paper Mill, Vancouver	Wells*	None	General
Columbia Winery, Vancouver	Wells	None	---
Golden West Guernsey Dairy, Vancouver	Wells	---	---
Great Western Malting Co., Vancouver	Wells (Port of Vancouver Auxiliary Supply)	None	---
Lucky Lager Brewery, Vancouver	Well	None	---
Pacific Building Materials Co., Vancouver	Columbia River	None	Truck washing
Spokane Portland & Seattle Railway, Vancouver	Well*	None	---
Valley Farms, Vancouver	Well	None	---
Vancouver Plywood Co., Vancouver	Columbia River	None	Cooling
Dubois Lumber Co., Vancouver	Well	None	Boiler feed
Lewis River Meat Co., Woodland	Wells	None	---
Woodland Valley Packing Co., Woodland	Wells	None	---
Columbia Veneer Co., Kalama	Columbia River	None	---

See footnote at end of table.

TABLE 20 -- INDUSTRIAL WATER SUPPLIES -- Continued

Name & Location of Industry	Source of Water Supply	Treatment	Principal Use
<u>WASHINGTON (Cont'd)</u>			
<u>Columbia River Main Stem (Cont'd)</u>			
Long-Bell Sawmills, Longview	Wells	As required	Cooling & boiler feed
Longview Meat Packing Co., Longview	Wells	None	---
Reynolds Aluminum Plant, Longview	Wells	Chlorination	General Plant use
Weyerhaeuser Timber Co., Longview	Columbia River	Filtration & chlorination	General Plant use
<u>Walla Walla River Basin</u>			
Green Giant Pea Canning Co., Dayton	Wells	---	Cooling
<u>Klickitat River Basin</u>			
Niels Lumber Co., Klickitat	Klickitat River	Filtration	---
<u>Lake River--Salmon Creek Basin</u>			
Clark Co. Dairymen's Coop., Battleground	Wells	None	Processing & city supply
<u>Cowlitz River Basin</u>			
Mayfield Canning Co., Mayfield	Small creek Springs	None	Processing
Dell Dairy, Winlock	Wells	None	Drinking
Longview Fiber Co., Longview	Cowlitz River	Chloramine	---
			General Plant use

* Also uses city water.

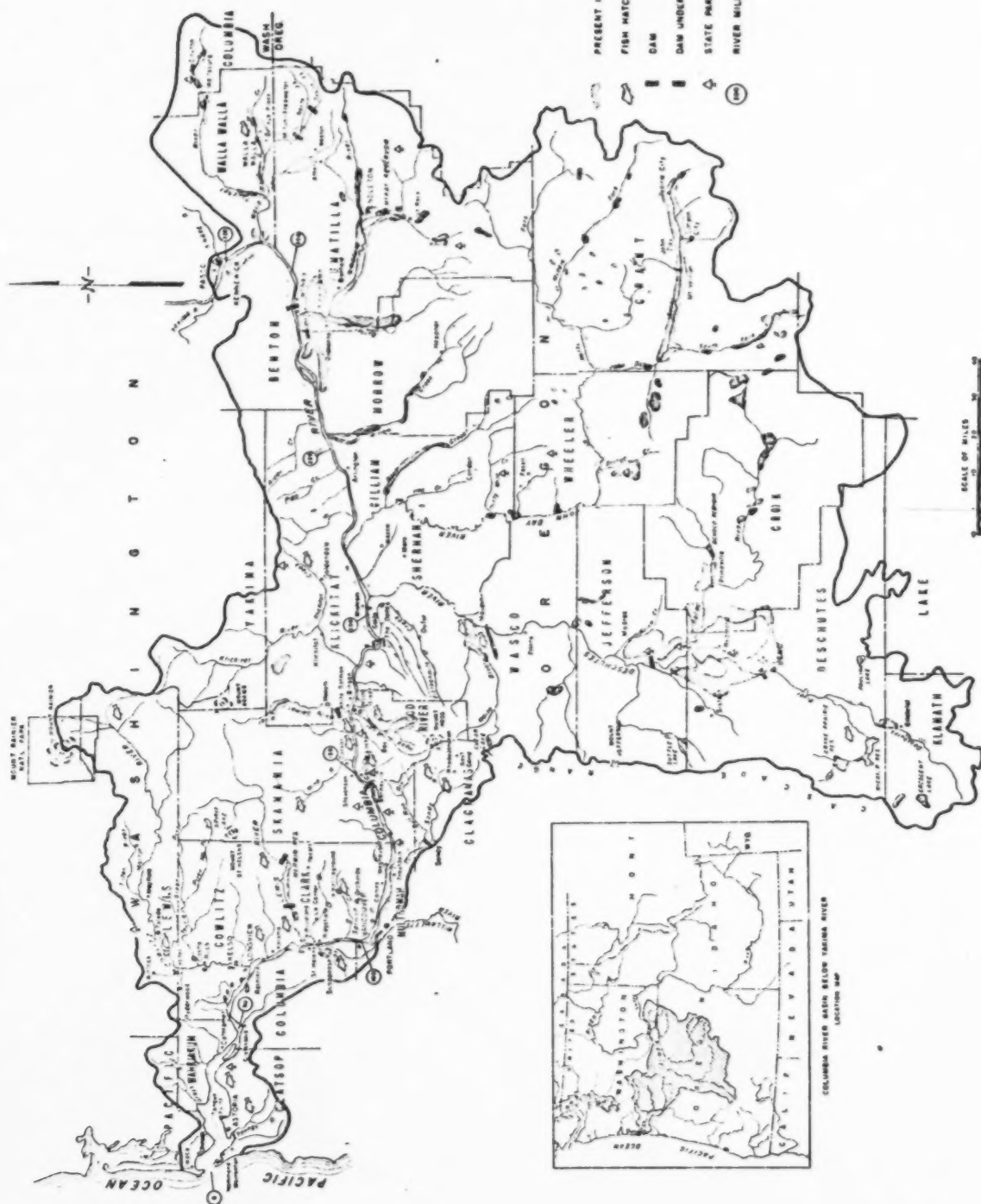
TABLE 21

PRINCIPAL WATER SUPPLIES -- PORTLAND METROPOLITAN AREA

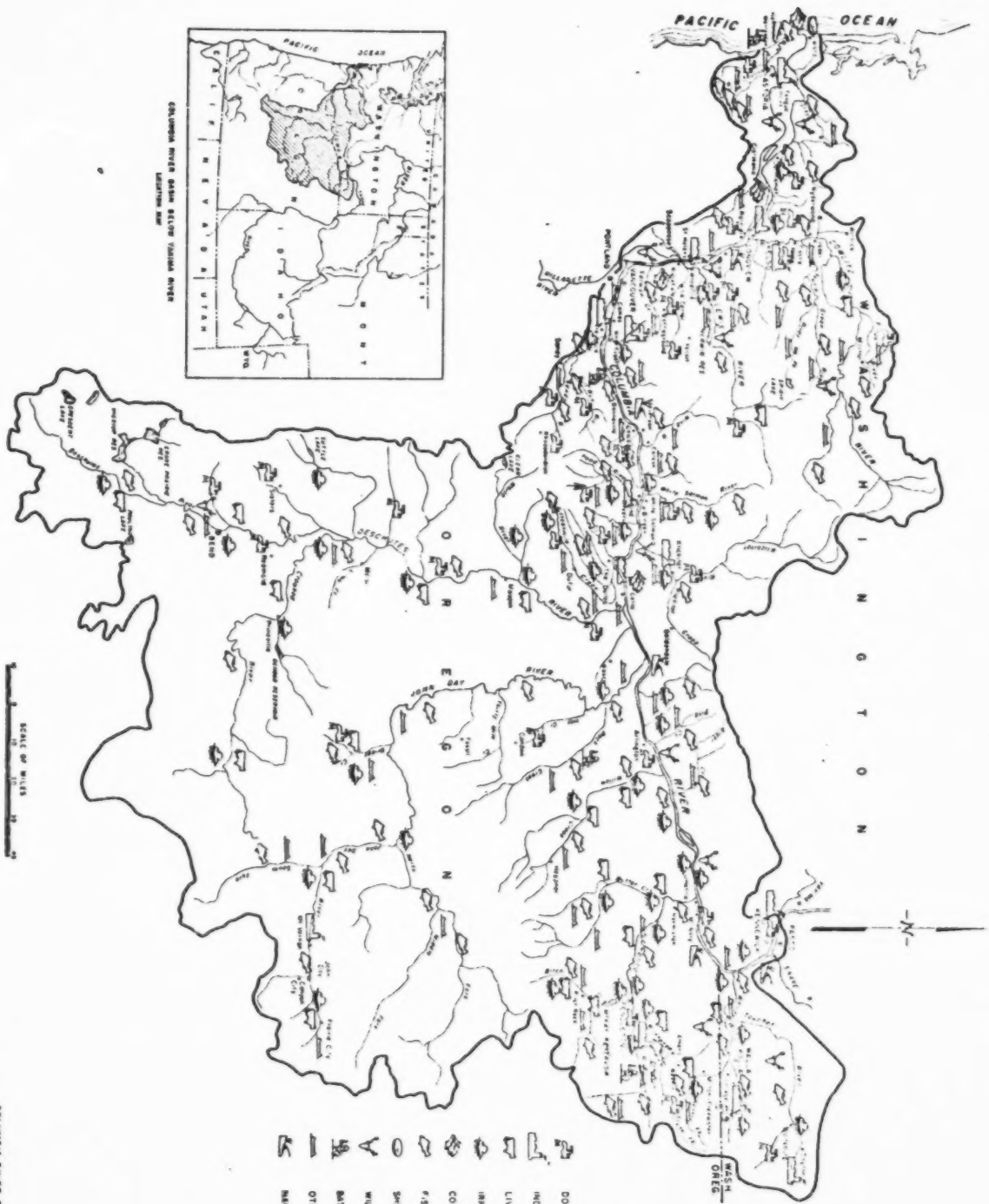
Supply	Type 1/	M.g.d. Water Requirements		Capacity of Supply Facilities M.g.d.	Capacity Filtration Plant M.g.d.
		Average Daily	Maximum Daily		
<u>Municipal</u>					
Portland	S	56.38	124.06	150.00	None
Vancouver	G	9.12	14.24	28.40	None
Oregon City-West Linn	S	2.55	3.00	3.00	None
Hillsboro	S	1.50	3.50	3.50	None
Camas	S & G	2.00	3.50	4.50	None
Milwaukie	G	.41	1.33	1.05	None
Forest Grove	S	.81	1.99	2.70	2.1
Oswego	G	.60	1.20	1.22	None
Beaverton	G	.25	.50	1.18	None
Subtotal		73.62	153.32	195.55	
<u>Industrial 2/</u>					
Crown Zellerbach Corp.	S & G	86.40	---	90.00	16.0
Crown Willamette Co.	S	40.80	---	40.80	12.0
Columbia River Paper Mills	G	24.00	---	24.00	None
Publishers Paper Co.	S	20.00	---	20.00	None
Pennsylvania Salt Mfg. Co.	S	17.30	---	17.30	None
Aluminum Co. of America	G	16.00	---	22.00	None
Portland Gas & Coke	S	12.96	---	12.96	None
Reynolds Metal Co.	G	11.52	---	11.52	None
Great Western Malting Co.	G	4.96	---	---	---
Vancouver Plywood Co.	G	4.33	---	---	---
Swift & Co.	G	2.40	---	7.20	None
Buffalo Electro-Chemical Co.	G	2.88	---	---	---
Oregon Shipyards	G	0.18	---	7.20	None
Libby McNeill & Libby	G	2.02	---	2.02	None
Portland Woolen Mills	S & G	1.15	---	1.15	None
Union Carbide & Carbon Co.	G	1.15	---	1.71	None
National Biscuit Co.	G	1.15	---	1.15	None
Port of Vancouver	G	1.33	---	2.88	None
Carborundum Co.	G	1.03	---	---	---
Pacific Carbide & Alloys	G	1.00	---	1.00	None
Gresham Berry Growers	G	.77	---	1.00	None
Damascus Milk Co.	G	.60	---	1.44	None
Forest Fibre Products	S	.50	---	0.72	None
Subtotal		254.43			
GRAND TOTAL		328.05			

1/ S = Surface supply; G = Ground supply.

2/ Average daily use of water by Industrial Plants represents the maximum daily or continuous use over a 24-hour period for most plants.

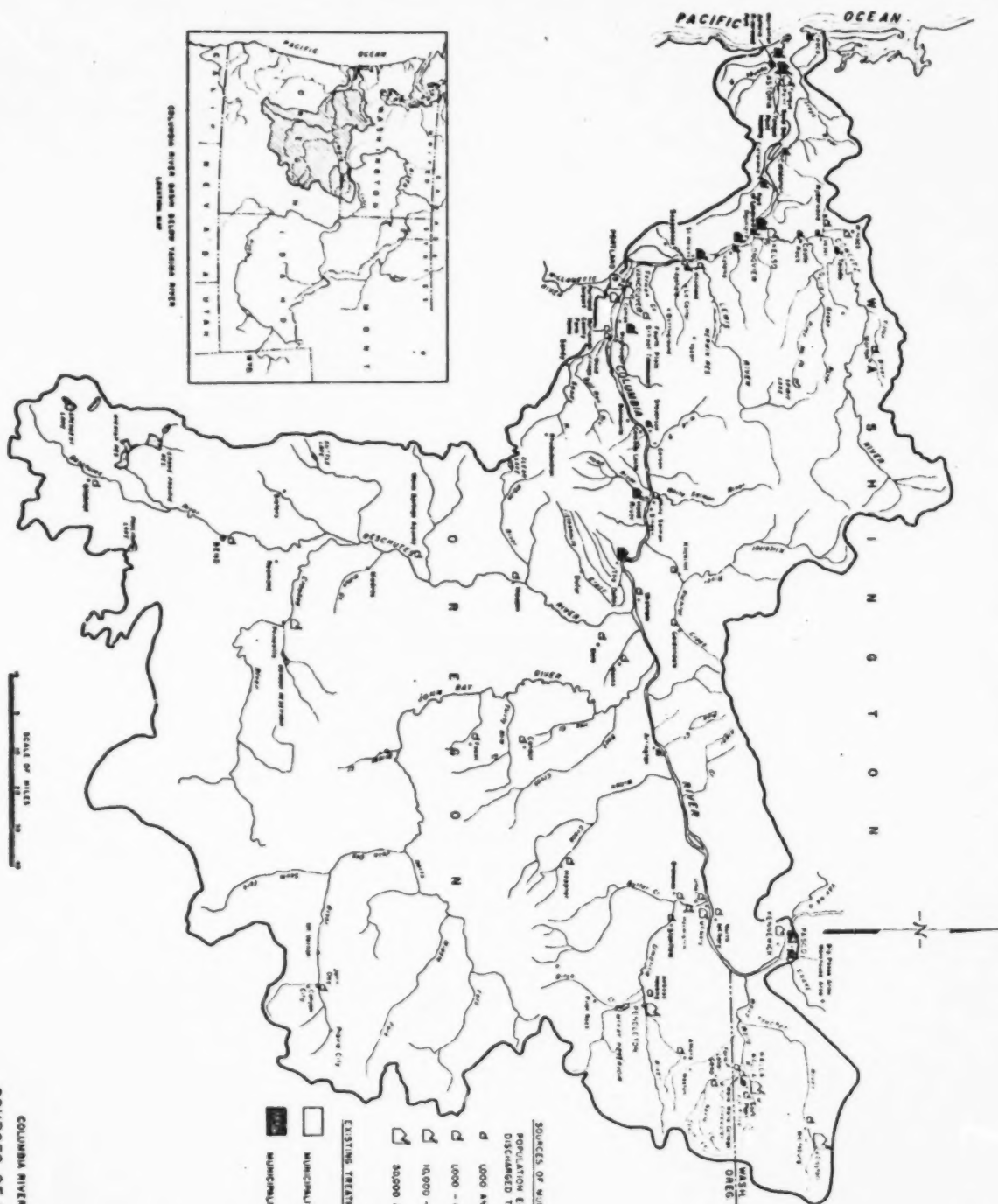


COLUMBIA RIVER BASIN BELOW YAKIMA RIVER
GENERAL REFERENCE MAP
 DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 Public Health Service
 DIVISION OF WATER POLLUTION CONTROL
 MAP NO. 1



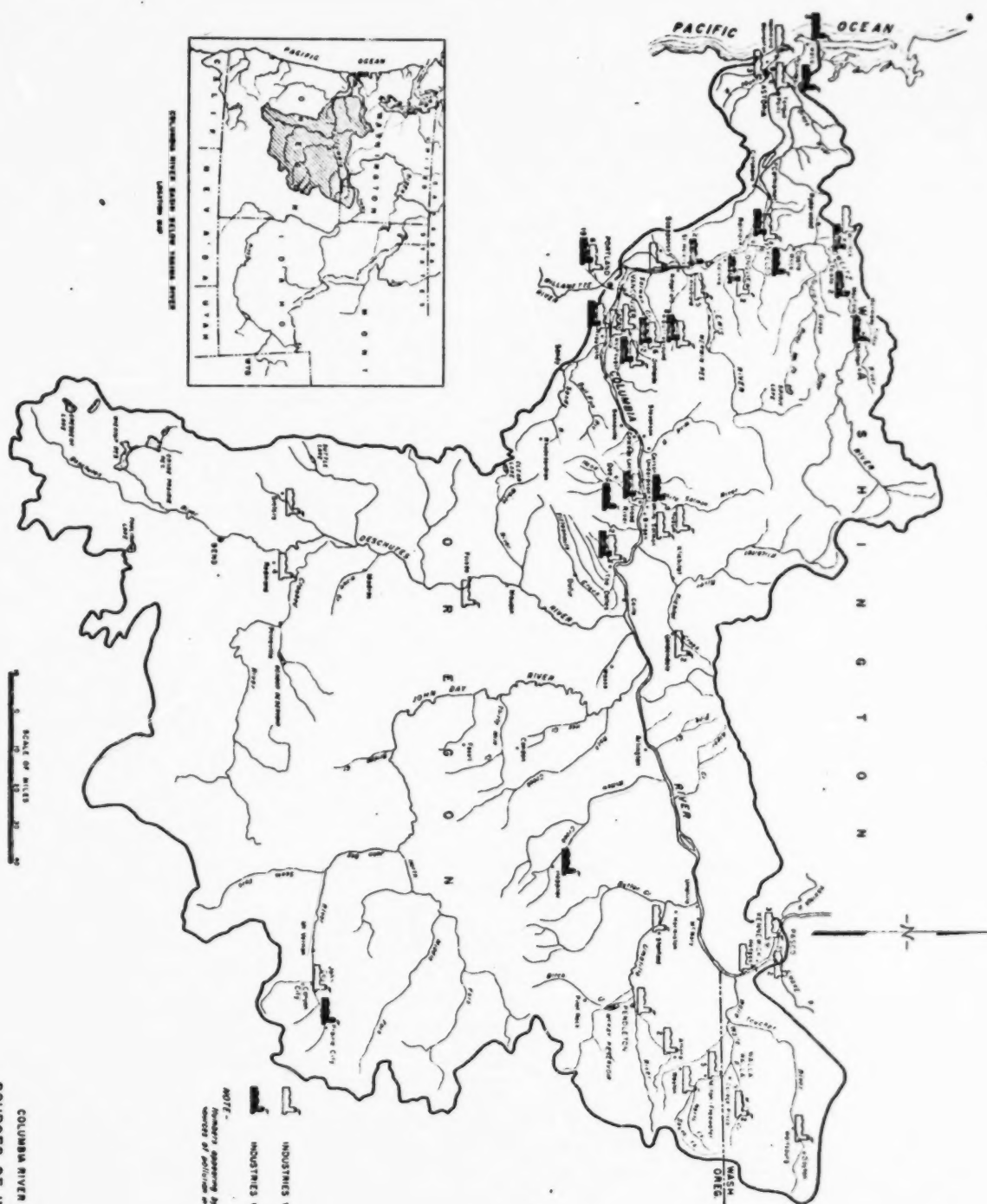
- LEGEND**
- DOMESTIC WATER SUPPLY
 - INDUSTRIAL WATER SUPPLY
 - LIVESTOCK
 - IRRIGATION
 - COMMERCIAL FISHING
 - FISH PROPAGATION
 - SHELLFISH
 - WILDLIFE
 - BATHING WATER
 - OTHER RECREATION
 - NAVIGATION

COLUMBIA RIVER BASIN BELOW YACIMA RIVER
EXISTING PRIMARY WATER USES
 DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 PUBLIC HEALTH SERVICE
 DIVISION OF WATER POLLUTION CONTROL
 MAP NO. 2



COLUMBIA RIVER BASIN BELOW YACOMA RIVER
 SOURCES OF MUNICIPAL POLLUTION
 AND
 EXISTING TREATMENT FACILITIES
 DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 PUBLIC HEALTH SERVICE
 DIVISION OF WATER POLLUTION CONTROL
 MAP NO. 3

- SOURCES OF MUNICIPAL POLLUTION**
 POPULATION EQUIVALENT (LOAD) OF WASTES
 DISCHARGED TO STREAM
- 1000 AND UNDER
 - ◻ 1000 - 10,000
 - ◻ 10,000 - 30,000 *
 - ◻ 30,000 AND OVER
- EXISTING TREATMENT FACILITIES**
- MUNICIPALITIES WITH TREATMENT FACILITIES
 - ◻ MUNICIPALITIES WITH NO TREATMENT FACILITIES

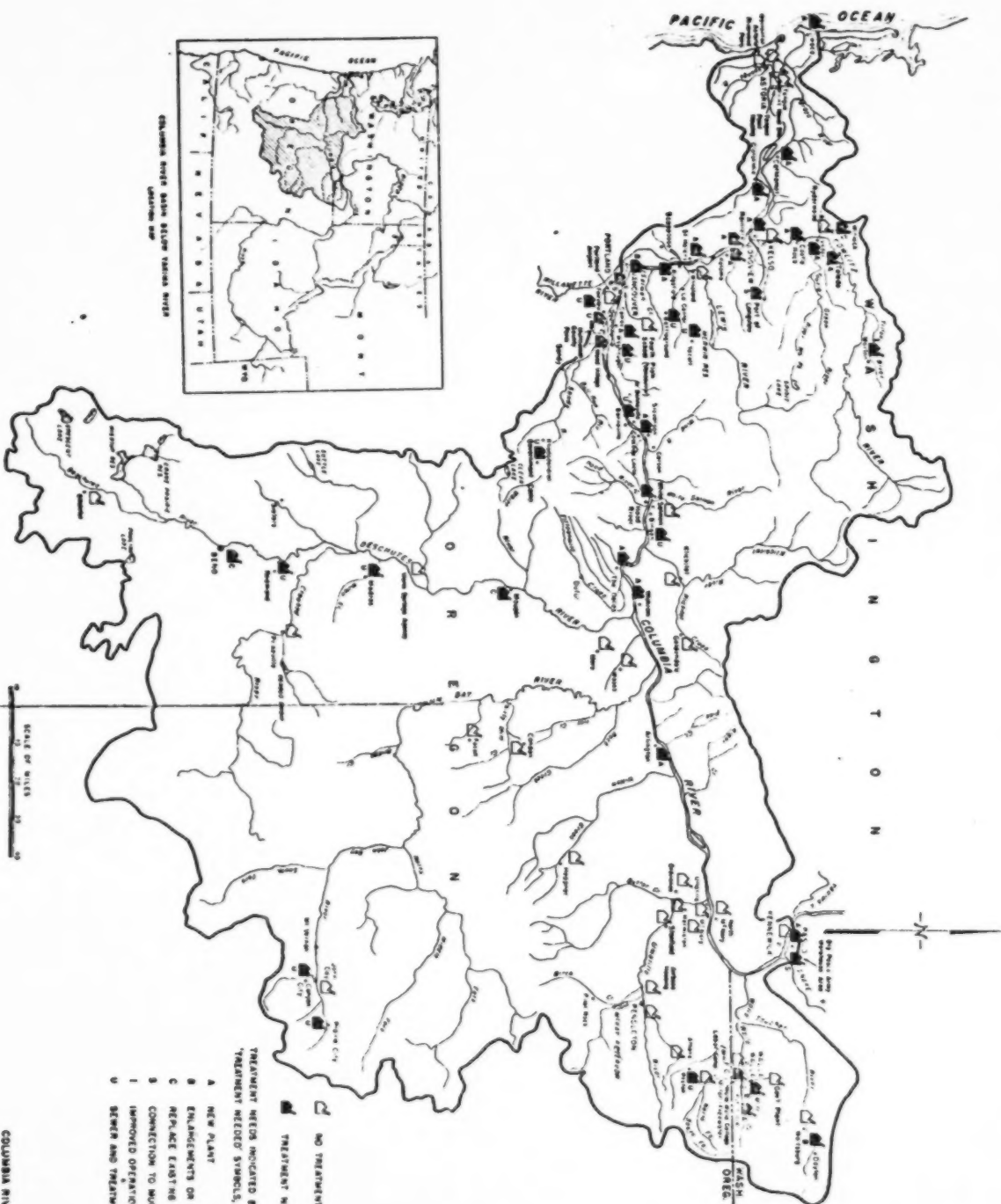


COLUMBIA RIVER BASIN BELOW YAKIMA RIVER
 LOCATION MAP

SCALE OF MILES
 0 5 10 15 20

COLUMBIA RIVER BASIN BELOW YAKIMA RIVER
 SOURCES OF INDUSTRIAL POLLUTION
 AND
 EXISTING TREATMENT FACILITIES
 DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 PUBLIC HEALTH SERVICE
 DIVISION OF WATER POLLUTION CONTROL
 MAP NO. 4

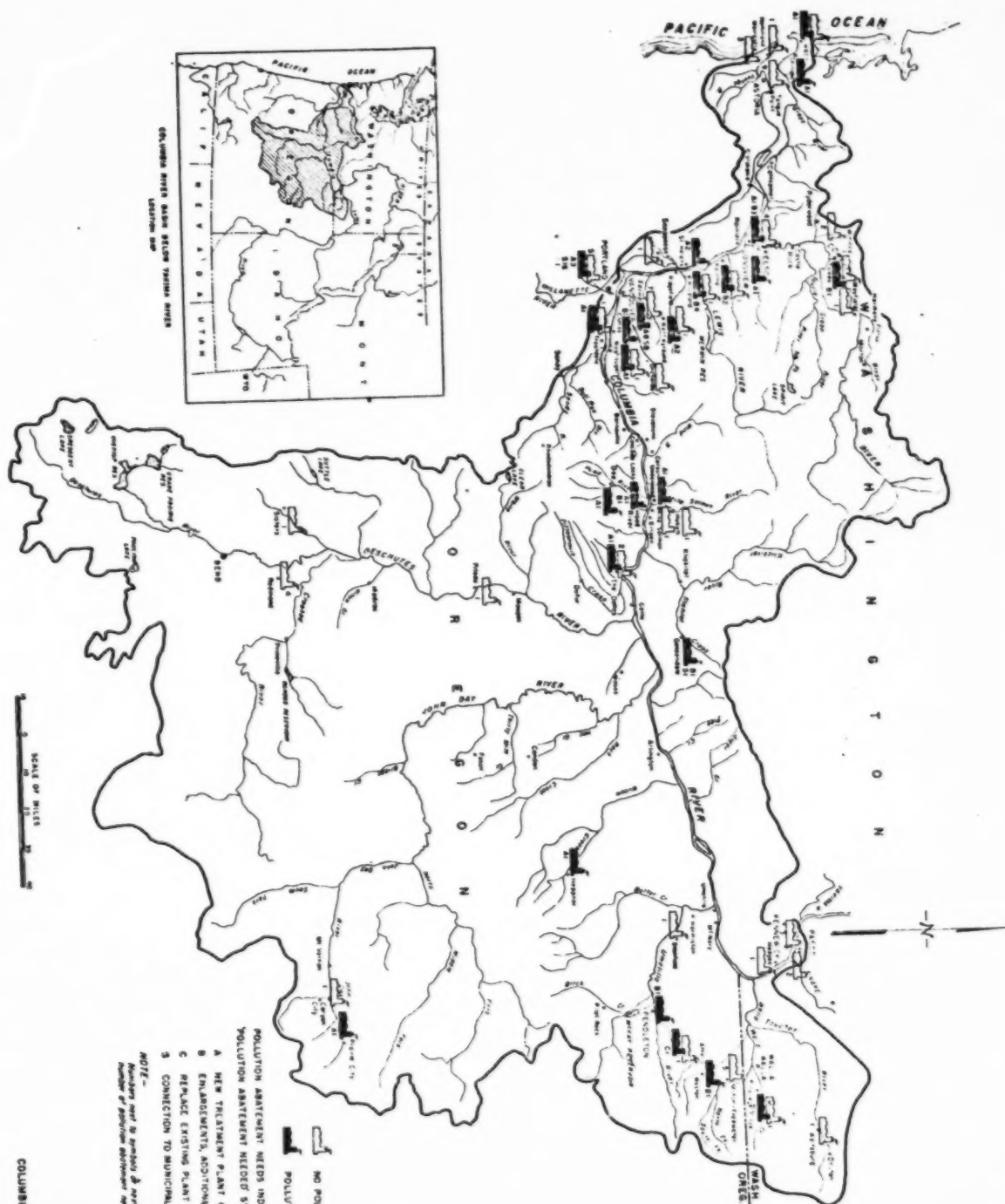
INDUSTRIES WITH TREATMENT FACILITIES
 INDUSTRIES WITH NO TREATMENT FACILITIES
 NOTE:
 Numbers appearing by symbols indicate size of industrial
 sources of pollution in the area in the category designated.



TREATMENT NEEDS INDICATED BY LETTERS APPEARING BY
TREATMENT NEEDS SYMBOLS AS FOLLOWS:

- A NEW PLANT
- B ENLARGEMENTS ON ADDITIONS TO EXISTING PLANT
- C REPLACE EXISTING PLANT
- D CONNECTION TO MUNICIPAL SEWER SYSTEM
- E IMPROVED OPERATION
- F SEWER AND TREATMENT PLANT

COLUMBIA RIVER BASIN BELOW TAIMA RIVER
MUNICIPAL
WASTE TREATMENT NEEDS
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
DIVISION OF WATER POLLUTION CONTROL
MAP No. 5



MUNICIPAL WATER SUPPLIES

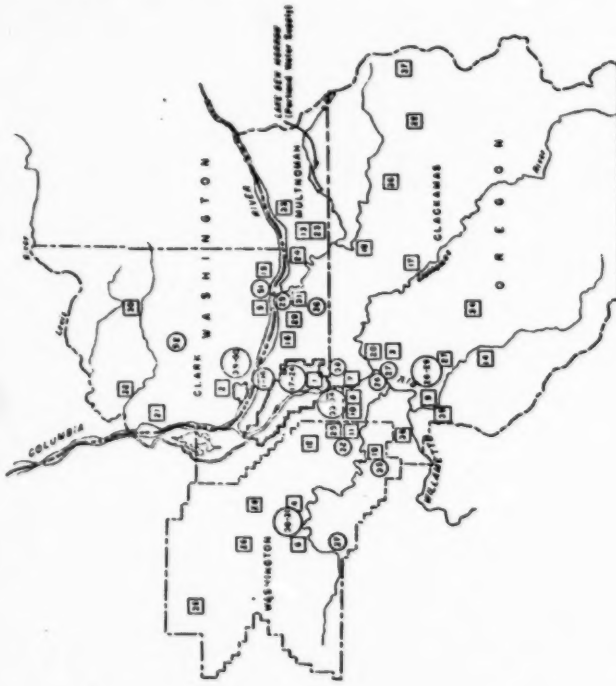
NO.	COMMUNITY	SOURCE	POP.
1	PORTLAND	SURFACE	419,000
2	VANCOUVER	SURFACE	49,750
3	SEASIDE	SURFACE	11,600
4	HILLSBORO	SURFACE	8,200
5	CLATSOP	SURFACE	9,000
6	FOREST GROVE	SURFACE	22,000
7	SEASIDE	SURFACE	22,000
8	CLATSOP	SURFACE	18,700
9	CLATSOP	SURFACE	18,700
10	CLATSOP	SURFACE	18,700
11	CLATSOP	SURFACE	18,700
12	CLATSOP	SURFACE	18,700
13	CLATSOP	SURFACE	18,700
14	CLATSOP	SURFACE	18,700
15	CLATSOP	SURFACE	18,700
16	CLATSOP	SURFACE	18,700
17	CLATSOP	SURFACE	18,700
18	CLATSOP	SURFACE	18,700
19	CLATSOP	SURFACE	18,700
20	CLATSOP	SURFACE	18,700
21	CLATSOP	SURFACE	18,700
22	CLATSOP	SURFACE	18,700
23	CLATSOP	SURFACE	18,700
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27	CLATSOP	SURFACE	18,700
28	CLATSOP	SURFACE	18,700
29	CLATSOP	SURFACE	18,700
30	CLATSOP	SURFACE	18,700
31	CLATSOP	SURFACE	18,700
32	CLATSOP	SURFACE	18,700
33	CLATSOP	SURFACE	18,700
34	CLATSOP	SURFACE	18,700
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39	CLATSOP	SURFACE	18,700
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41	CLATSOP	SURFACE	18,700
42	CLATSOP	SURFACE	18,700
43	CLATSOP	SURFACE	18,700
44	CLATSOP	SURFACE	18,700
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47	CLATSOP	SURFACE	18,700
48	CLATSOP	SURFACE	18,700
49	CLATSOP	SURFACE	18,700
50	CLATSOP	SURFACE	18,700

NOTE - See Portland steady service

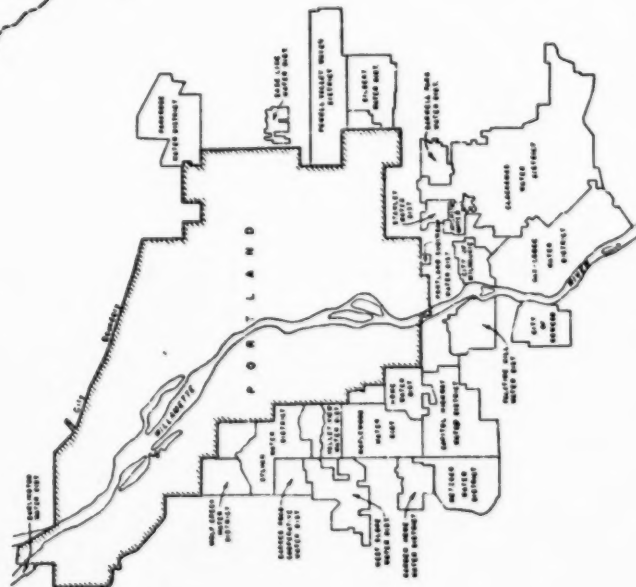
INDUSTRIAL WATER SUPPLIES

INDUSTRY & LOCATION	SOURCE
1. SALT & CO.	SURFACE
2. PACIFIC CARBON & ALLIANCE CO.	SURFACE
3. NATIONAL BROS. CO.	SURFACE
4. WESTERN WAX PAPER CO.	SURFACE
5. WESTERN WAX PAPER CO.	SURFACE
6. WESTERN WAX PAPER CO.	SURFACE
7. STEAM & HEAT CO.	SURFACE
8. STEAM & HEAT CO.	SURFACE
9. STEAM & HEAT CO.	SURFACE
10. STEAM & HEAT CO.	SURFACE
11. STEAM & HEAT CO.	SURFACE
12. STEAM & HEAT CO.	SURFACE
13. STEAM & HEAT CO.	SURFACE
14. STEAM & HEAT CO.	SURFACE
15. STEAM & HEAT CO.	SURFACE
16. STEAM & HEAT CO.	SURFACE
17. STEAM & HEAT CO.	SURFACE
18. STEAM & HEAT CO.	SURFACE
19. STEAM & HEAT CO.	SURFACE
20. STEAM & HEAT CO.	SURFACE
21. STEAM & HEAT CO.	SURFACE
22. STEAM & HEAT CO.	SURFACE
23. STEAM & HEAT CO.	SURFACE
24. STEAM & HEAT CO.	SURFACE
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26. STEAM & HEAT CO.	SURFACE
27. STEAM & HEAT CO.	SURFACE
28. STEAM & HEAT CO.	SURFACE
29. STEAM & HEAT CO.	SURFACE
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46. STEAM & HEAT CO.	SURFACE
47. STEAM & HEAT CO.	SURFACE
48. STEAM & HEAT CO.	SURFACE
49. STEAM & HEAT CO.	SURFACE
50. STEAM & HEAT CO.	SURFACE

COLUMBIA RIVER BASIN BELOW YAKIMA RIVER
MUNICIPAL
AND
INDUSTRIAL WATER SUPPLIES
PORTLAND METROPOLITAN AREA
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 7



PORTLAND METROPOLITAN AREA



PORTLAND CITY WATERWORKS SERVICE AREA